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Nebraska GIS Steering Committee

Building a Spatial Data Infrastructure for Nebraska – September 2000



*Coordinating the Implementation of GIS Technology at
the State and Local Government Level*

— A Strategic Plan and Annual Report

NEBRASKA GEOGRAPHIC INFORMATION SYSTEMS
STEERING COMMITTEE

**BUILDING A SPATIAL DATA
INFRASTRUCTURE FOR NEBRASKA**

A Strategic Plan and Annual Report

September 2000

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Building a Spatial Data Infrastructure for Nebraska – September 2000

An Executive Summary

Geographic information is a significant subset of the information explosion that has occurred over the last two decades. In the broadest sense, geographic information is information that includes a spatial reference (street address, latitude/longitude, section/township) as part of the data and is generically referred to as *geospatial or spatial data*.

The geographic component of information has become increasingly important as information technologies, such as Geographic Information Systems (GIS), have been developed to analyze and display information based on its location. Location or place is an important aspect of most data collected and used by public agencies. GIS was initially developed primarily for use in the area of natural resources management. However, as the software's capabilities and the understanding of the technology has grown, the use of GIS has now expanded to include a wide and rapidly growing range of applications (assessment, economic development, transportation planning, public safety, emergency response, etc.). Because of the powerful capabilities of GIS and other geospatial technologies, many public agencies (state, local and federal) are making investments in the technology and more will do so in the future.

IMPORTANCE OF SPATIAL DATA COORDINATION

Many GIS experts suggest that 70 to 80% of GIS implementation costs are commonly related to geospatial data development or acquisition. Fortunately, one of the more powerful features of GIS is its capability to facilitate the sharing and integration of data from a wide variety of data themes and sources. Past experience has taught public agencies the importance of coordination in making investments in information technology infrastructure. Public agencies have learned that through coordination they can aggregate demand and avoid the costly development of duplicate, non-compatible, computer and communication networks. As our understanding of GIS technology costs and requirements has matured, there is also a growing appreciation of the importance of coordination in the development of a common *spatial data infrastructure*, as a way to avoid the costly development of duplicate, non-compatible spatial data.

To take maximum advantage of the GIS capability to share and integrate data, and to secure the maximum return from public investments in geospatial data, it is important that public investments in geospatial data are coordinated across all levels and types of public agencies. State coordinating bodies, like the Nebraska GIS Steering Committee, are evolving to play a pivotal role in a loosely coordinated state, federal and local effort to build a common *National Spatial Data Infrastructure (NSDI)*. The purpose of this plan is to identify those key components and initiatives that are critical to the pursuit of a coordinated GIS development strategy and the development a common *Spatial Data Infrastructure for Nebraska*.

PROJECT BACKGROUND

The Nebraska Geographic Information Systems (GIS) Steering Committee was created by the Nebraska Legislature in 1991 as an intergovernmental coordinating body appointed by the Governor to guide the implementation of GIS technology in Nebraska. Since its inception, the GIS Steering Committee has defined long-range goals and objectives for its work; has established several working intergovernmental Advisory Committees; and has undertaken numerous coordinated initiatives to facilitate data sharing and the development of commonly

needed geospatial data. While much has been accomplished through these coordinated efforts, as the demand for its coordination services has grown, the Steering Committee's overall effectiveness has been hampered by a lack of resources.

The GIS Steering Committee is currently pursuing several coordination initiatives and has identified others that are in need of attention. As part of its coordination efforts, the Steering Committee has informed the Nebraska Information Technology Commission (NITC) and Nebraska's Chief Information Officer (CIO) of these initiatives and of the need for additional resources to effectively fulfill its responsibilities. The GIS Steering Committee recognized it would be helpful to policy makers if they prepared a strategic plan that provides an overview of what needs to be done, the benefits of those initiatives, defines specific project proposals and outlines the resources required.

SCOPE AND OBJECTIVES

Because GIS/geospatial technologies provide powerful information technology tools that are well suited for a wide range of governmental functions, it is likely that the trend of public agencies to adopt this technology will continue and escalate. As a result, over the next several years, it is very likely that a large amount of public resources will be invested in these technologies and their associated data.

It is not within the scope of this strategic plan to directly address all of these public investments. In general the most effective and efficient GIS is one that is integrated with the rest of a particular agency's information technology (hardware, software and databases). However, it is generally recognized that there is much to be gained by efforts to coordinate these investments across the various levels and types of public agencies and thereby help to secure the maximum overall return from these public investments in geospatial technology.

Examples of these coordination initiatives include the facilitation of geospatial data sharing; the collaborative development and maintenance of widely needed, geospatial databases; the development and promotion of data standards; and the development of the organizational structures and processes necessary to provide this overall, on-going interagency coordination. Collectively these initiatives in support of coordinated GIS development are commonly referred to as the development of a *Spatial Data Infrastructure (SDI)*.

The purpose of this plan is to identify those key components and initiatives that are critical to the pursuit of a coordinated Nebraska GIS development strategy and to define the projects necessary to develop a common *Spatial Data Infrastructure for Nebraska*.

BENEFITS AND MODEL FOR COORDINATED GIS DEVELOPMENT IN NEBRASKA

Because a coordinated approach to GIS implementation will require a significant investment of public resources to develop the basic *Spatial Data Infrastructure*, it is appropriate that the case be made for the benefits of these investments. One section of this strategic plan outlines the benefits of geospatial technologies and what is gained by investing in a coordinated approach to their implementation. Another section provides a conceptual outline of a coordinated implementation model for Nebraska.

To outline the benefits of GIS, numerous examples are provided to illustrate the importance of location or place for much of the data collected and used by public agencies. Also provided is

an overview of the powerful analytical tools that GIS and related geospatial technologies offer for analyzing and displaying data based upon its locational component. Local and national anecdotal evidence about the merits of the technology is also noted, such as the Lancaster County Assessors Office report that the number of taxpayer assessment protest has decreased 66% in their office over the last 4-5 years. They attribute a significant portion of this decrease to their GIS, its contributions to improving their assessment database, and its capability to graphically display to taxpayers comparable property and sales in their neighborhoods. Or Lincoln Police Chief Tom Casady's statement, *"I would be hard-pressed to pick which is most significant, the value of GIS for crime analysis and targeting strategies, or the value of GIS for informing the general public¼ "*.

As R.W. Greene, the author of a recent book that examines the impact of GIS on public policy, notes in the introduction to the book,

*"GIS is not new to the world of government and public policy. But like other high-tech phenomena, it has for too long been viewed as the exotic realm of specialists. This is changing. The realization is growing that almost everything that happens in a public policy context also happens in a geographic one: transportation planners, water resources studies, education subcommittees, redistricting boards, planning commissions, and crime task forces all must consider questions of where along with the usual ones of how, and why, and how much will it cost. GIS, by answering the first question, helps to answer the others."*¹

A GIS cost/benefit study published by the State of Montana *"predicted benefit/costs ratio ranging from 1.2 - 5.6 for case studies producing effectiveness benefits. In other words for every dollar spent on running a GIS application the return on investment ranged from \$1.20 to \$5.60."* That study also noted that the key to maximizing the overall return on public investments in GIS-related technologies is the cooperative development and maintenance of a common spatial data infrastructure.

*"Agencies need to establish internal and inter-agency agreements on data standards and data maintenance responsibilities prior to GIS implementation. The elimination of redundant data maintenance and adherence to common data standards will provide the largest economic gains in the long run."*²

The focus of this strategic plan is the development of a common Spatial Data Infrastructure for Nebraska, which is directly related to these objectives of eliminating redundant data maintenance and adherence to common data standards. At the core of a Nebraska Spatial Data Infrastructure is the development and maintenance of a set of standardized geospatial databases that have been prioritized for development because of their widespread use by a wide variety of agencies for a wide variety of applications. Because of their widespread use, this select set of geospatial databases has become known as Framework Databases. These Framework Databases include: aerial photography, surface elevation models, surface water features, transportation networks, geodetic control, governmental unit boundaries, Public Land Survey System corners, and property parcels.

¹ Greene, R.W.. *GIS in Public Policy* ESRI Press, Redlands, CA. June 2000. p. xii.

² Analysis of Geographic Information Systems (GIS) Implementations in State and County Governments of Montana. Logan McInnis and Stuart Blundell, Montana Geographic Information Council, Helena, MT, December 1998.

In addition to the specific focus on the Framework Databases, the concept of a Spatial Data Infrastructure also includes the necessity of developing:

- arrangements to facilitate the cooperative development and maintenance of these databases;
- mechanisms for users to find and share available geospatial databases;
- standard procedures for documenting geospatial databases so they can be used appropriately by others; and
- institutions to facilitate on-going communication and cooperation among GIS and geospatial spatial data users.

The development of these key arrangements and institutions of a Spatial Data Infrastructure are also addressed in this strategic plan.

OUTLINING A STRATEGIC DIRECTION

The Nebraska GIS Steering Committee mission statement outlined below, served as a guide for the development of this GIS strategic plan.

The mission of the Nebraska Geographic Information System Steering Committee is to encourage the appropriate utilization of GIS technology and to assist organizations to make public investments in GIS technology and geospatial data in an effective, efficient, and coordinated manner.

Based upon its mission statement, an assessment of the current situation, and a shared conceptual vision for a future model of a Spatial Data Infrastructure for Nebraska, the GIS Steering Committee has outlined a strategic direction, which includes goals and a series of proposed initiatives and/or projects designed to realize those goals.

INITIATIVE 1 — PRIORITY DATABASE DEVELOPMENT AND MAINTENANCE.

Coordinate the development of widely needed digital geospatial databases in a standard reference format and establish systems for the on-going cooperative maintenance and enhancement of these priority geospatial databases.

A core subset of geospatial databases is needed by a wide range of state, local and federal government agencies and private entities. The cooperative development and maintenance of these core databases is the most cost-effective means of providing these databases. These core databases also provide the framework for the development of numerous of geospatial databases. The cooperative development of standardized framework databases will minimized costly duplication of effort, facilitate data sharing and minimize costly data integration problems due to incompatible data. In addition to the specific database development projects outlined under this initiative, the collaborative database development fund proposal outlined under the initiative to strengthen the GIS Steering Committee's coordination capacity is particularly relevant to this database development initiative. The specific projects proposed under this initiative include:

- | | |
|--|--|
| - Surface Water Features Database | - Ground Water Features-Wells Database |
| - Aerial Photography Database | - Earth's Surface Elevation Model Database |
| - Public Land Survey System Database | - Transportation Network Database |
| - Governmental Units Boundary Database | - Soil Surveys Database |
| - Street Addresses Database | |

INITIATIVE 2 — LAND RECORDS MODERNIZATION. *Promote and facilitate local government land record modernization and GIS development.*

One of the most promising and cost-effective application areas of GIS technology is the modernization of how local government land records are maintained and accessed. In addition to land record modernization, there are numerous other potential local government applications of GIS technology (emergency response, public health and safety, zoning, taxation, street and utility maintenance, etc.) The property parcel/land record information maintained by local governments is also one of the framework geospatial databases that are needed by a wide variety of state, local and federal agencies and private entities. It is in the interest of the broader GIS user community that this land record information be developed in a standardized geospatial format that is accessible to multiple users at the local, state and federal level. Because of the limited resources at the local government level, partnerships will be necessary in many areas to facilitate the development and maintenance of this data. In addition to the following proposed projects specifically listed under this initiative, the aerial photography database, the PLSS database, the Regional Professional Services Centers, and the outreach/education program listed under other initiatives also contribute to realizing this initiative.

- Model Inter-local Agreements

- Multipurpose Land Info. System Guidelines

INITIATIVE 3 — TECHNICAL ASSISTANCE. *Provide technical assistance to local governments and state agencies.*

With the growing interest in GIS, the technology is no longer just being used by a limited number of fairly large public agencies. It is becoming a powerful mainstream information technology, with a wide variety of state and local level agencies either developing or having an interest in developing GIS applications. With this growing interest in the technology, there is a parallel growing need for technical assistance to help these agencies develop their GIS/geospatial data or applications. These technical assistance needs range from guidance in designing and planning the development of an in-house capability; to specialized GIS application development; to large-scale geospatial data development projects; to on-going development and maintenance of specific GIS applications. Up to this point, the primary operational model in Nebraska has been for each agency or local government to develop and maintain its own in-house GIS capability. With more and more agencies expressing interest in the technology, it is time to consider the merits and efficiencies that might be gained by arrangements to aggregate the demand and resources available to support these technical services.

- Regional Professional Services Centers

- State GIS Service Bureau

INITIATIVE 4 — EDUCATION/OUTREACH. *Promote an educational outreach program designed to maximize the overall return on public investments in the development of geographically referenced databases and GIS systems by providing educational materials, presentations and coordination services to the public officials and technical staff who will be making these investment decisions.*

While GIS can no longer be considered a new technology, it is still new and relatively complex for many of the agencies and policy makers who are now considering their initial public investments in the technology. Without education and/or technical assistance these public sector decision-makers can easily make costly mistakes in their initial GIS investment decisions.

The risks of costly mistakes have less to do with the hardware and software, and more with data purchase or development decisions. Public investments in a GIS educational/outreach program, directed toward government decision-makers, will increase the probability of wise public investment decisions in GIS technology. Such an education program will increase the likelihood that costly geospatial databases developed for one area and application, will not only work as intended for that application, but also for other areas and applications. Such an education/outreach program is a vital component of a coordinated GIS development effort.

- GIS Education/Outreach Program
- Nebraska GIS Symposium

INITIATIVE 5 — DATA SHARING AND DISTRIBUTION. *Develop structures, standards, and processes that facilitate easy access to, integration, and usability of publicly available geospatial data.*

A key component of any coordinated GIS development strategy must be the development and maintenance of mechanisms to facilitate the sharing of commonly needed geospatial data. There are several essential elements to such a data sharing strategy. These include the easy ability to discover the existence of data and how it is accessed. The documentation of the data to facilitate its proper use is another essential element, as is the establishment and wide implement of data standards to facilitate data integration. Geospatial data users and types of data are diverse and data sharing strategies must address this diversity of users and needed data (natural resources, demographics, land records, transportation, utilities, city/regional/state/federal, etc.) Proposed projects under this initiative include:

- Metadata Development
- Geospatial Data Clearinghouse
- Geospatial Data Sharing Cooperative

INITIATIVE 6 — STRENGTHEN COORDINATION CAPACITY. *Strengthen the GIS Steering Committee's operational capability to facilitate the implementation of priority geospatial database development decisions, data sharing, interagency/intergovernmental partnerships, and agencies' utilization of GIS technology.*

While Nebraska statutes define broad areas of responsibilities for the Nebraska GIS Steering Committee, the Committee has very little in the way of independent authority and/or resources to seriously address those responsibilities. With limited authority and no operational capability or budget, Steering Committee decisions and priorities can only be implemented through the sponsorship and active support of independent state, local or federal agencies. The coordination of GIS development for the overall good of the broad and growing Nebraska GIS user community is a unique and challenging mission not specifically shared by any other public entity. In some specific instances other agencies' missions and priorities are congruent with those of the Steering Committee and in those cases those agencies may take the lead on a project on behalf of the Steering Committee. However, where this parallel sense of priorities does not exist, the Steering Committee is seriously limited in its ability to implement its priorities.

Many of today's major geospatial data development efforts are only feasible through intergovernmental partnerships. The Steering Committee's structure is poorly suited to facilitating the actual implementation of those partnership projects. The availability of seed funding specifically dedicated to collaborative GIS development efforts and the ready access to institutional channels whereby the resources from intergovernmental partners could be

efficiently combined and leveraged would enhance the Steering Committee's ability implement collaborative GIS development projects.

In addition to the specific project proposal for a Collaborative Database Development Fund that is outlined under this initiative, three other proposed projects that outlined under other initiatives (State GIS Service Bureau, Education/Outreach Program and the Geospatial Data Clearinghouse) would also significantly contribute to the realization of this initiative.

- Collaborative Database Development Fund

Building a Spatial Data Infrastructure for Nebraska

Nebraska GIS Steering Committee

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Building a Spatial Data Infrastructure for Nebraska — September 2000

*Nebraska Geographic Information Systems
Steering Committee*

INTRODUCTION

Geographic information is a significant subset of the information explosion that has occurred over the last two decades. In the broadest sense, geographic information is information that includes a spatial reference (street address, latitude/longitude, section/township) as part of the data records and will be generically referred to in this strategic plan as *geospatial or spatial data*.

The geographic component of information has become increasingly important as information technologies, such as Geographic Information Systems (GIS), have been developed to analyze and display information based on its location. Geographic information systems were initially developed primarily for use in the area of natural resources management. However, as the software's capabilities and the understanding of the technology has grown, the use of GIS has now expanded to include a wide and rapidly growing range of applications (assessment, economic development, transportation planning, public safety, emergency response, etc.). Because of the powerful capabilities of GIS and other geospatial technologies, many public agencies (state, local and federal) are making public investments in the technology and more will do so in the future.

In general, the most effective and efficient GIS is one that is integrated with the rest of a particular agency's information technology (hardware, software and databases). However, one of the powerful features of GIS is its capability to facilitate the sharing and integration of data from a wide variety of data themes and sources, based upon its associated spatial location. To take maximum advantage of this GIS capability to share and integrate data, and to secure the maximum return from public investments in geospatial data, it is important that these investments are coordinated across levels and types of government agencies. The purpose of this plan is to identify those key components and initiatives that are critical to the pursuit of a coordinated GIS development strategy and the development a common *Spatial Data Infrastructure for Nebraska*

PROJECT BACKGROUND

The Nebraska Geographic Information Systems (GIS) Steering Committee was created by the Nebraska Legislature in 1991 as an intergovernmental coordination body appointed by the

Governor to guide the implementation of GIS technology in Nebraska. Prior to its formal establishment by the Legislature, earlier GIS coordination was accomplished through an Advisory Committee of the Nebraska Intergovernmental Data Communications Advisory Council (NIDCAC) and other informal groups.

Since its inception, the GIS Steering Committee has defined long-range goals and objectives for its work, has established several intergovernmental working Advisory Committees, and has undertaken numerous coordinated initiatives to facilitate data sharing and the development of commonly needed geospatial data. These numerous coordination efforts have been documented in Annual Reports submitted since 1992. While much has been accomplished through these coordinated efforts, the Steering Committee's overall effectiveness has been hampered by a lack of resources.

The GIS Steering Committee is currently pursuing several coordination initiatives and has identified others that are in need of attention. As part of its coordination efforts, the Steering Committee has informed the Nebraska Information Technology Commission (NITC) and Nebraska's Chief Information Officer (CIO) of these initiatives and of the need for additional resources to effectively fulfill its responsibilities. A suggestion by the CIO was the immediate stimulus for the development of this strategic plan. The CIO suggested that it would be helpful to policy makers if the Steering Committee would prepare a strategic plan that provides an overview of what needs to be done, the benefits of those initiatives, defines specific project proposals and outlines the resources required.

SCOPE AND OBJECTIVES

GIS and other geospatial technologies are being adopted by a variety of government agencies and other public entities at all levels of government. Because this technology provides powerful information technology tools that are well suited for a wide range of governmental functions, it is likely that this adoption trend will continue and escalate. As a result, over the next several years, it is very likely that a large amount of public resources will be invested in these technologies and their associated data.

It is not within the scope of this strategic plan to directly address all of these public investments. As was noted above, in general the most effective and efficient GIS is one that is integrated with the rest of a particular agency's information technology (hardware, software and databases). However, it is generally recognized that there is much to be gained by efforts to coordinate these investments across the various levels and types of public agencies and thereby help to secure the maximum overall return from these public investments in geospatial technology.

Examples of these coordination initiatives include the facilitation of geospatial data sharing; the collaborative development and maintenance of widely needed, geospatial databases; the development and promotion of data standards; and the development of the organizational structures and processes necessary to provide this overall, on-going interagency coordination. Collectively these initiatives in support of coordinated GIS development are commonly referred to as the development of a *Spatial Data Infrastructure (SDI)*.

The purpose of this plan is to identify those key components and initiatives that are critical to the pursuit of a coordinated GIS development strategy and to define the projects necessary to develop a *Spatial Data Infrastructure for Nebraska*. Specific objectives of the plan include:

- Defining the benefits of coordinated public investments in geospatial technologies and the development of a Spatial Data Infrastructure for Nebraska.
- Outlining a development model for Nebraska's Spatial Data Infrastructure.
- Analyzing of the current status of the Spatial Data Infrastructure for Nebraska.
- Identifying and defining the mission and goals related to the development of a Spatial Data Infrastructure for Nebraska.
- Identifying and defining the strategic or long-term initiatives and activities that provide the necessary framework for enhancing a Spatial Data Infrastructure for Nebraska.

PLANNING METHODOLOGY

This plan for development of a common Spatial Data Infrastructure for Nebraska was developed using the strategic and tactical planning process that is presented on the following page. This methodology has three distinct components or phases: current situation assessment, strategy formulation, and implementation or tactical planning. In the current situation assessment phase, the present environment was confirmed in terms of past performance, current capabilities (strengths and weaknesses), and external influences (opportunities and threats). This analysis yields the strategic issues that must be addressed in the plan.

The strategic planning process involved defining the mission and values of an SDI for Nebraska. Based on these goals and strategies and given the available technical environment and possible resources, a future vision was crafted. This vision identifies the organization, structures, policies, information technology and data resources that will make up the Nebraska SDI.

The strategies and initiatives needed to realize this vision were subsequently developed and served as the basis for organizing tactical plans for the enhancement of the Nebraska SDI. The tactical plans present the project, resources, budgets and milestones for this geospatial coordination effort.

As a starting point for developing this strategic plan, the GIS Steering Committee referred to and updated its existing long-range goals and objectives, its vision statements and position papers from previous Annual Reports, as well as Advisory Committee and project proposals. The Steering Committee's Coordinator compiled this information to provide a baseline for future planning discussions. To develop this plan, the GIS Steering Committee met in three planning sessions. The first session focused on an analysis of the current situation (internal strengths, weakness and external opportunities and threats); the development of a listing of system requirements to facilitate coordinated GIS development; goals and objectives; and a listing of possible initiatives to realize those system requirements. The second session focused on prioritizing and refining specific tactical project proposals. The third session focused on a review and revision of the final draft of this strategic planning document. As the planning process went forward, other interested groups were invited to provide feedback and input on the draft plans, which were posted on the Internet.

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BENEFITS OF COORDINATED PUBLIC INVESTMENT IN GIS TECHNOLOGY

Because of its overall complexity and the subjective nature of many of the benefits of GIS, few detailed GIS cost/benefit analyses have been conducted. However, in 1998 the State of Montana published³ a detailed cost/benefit analysis of GIS implementation in state and county governments based on an analytical model developed for federal agencies. That analysis of 10 case studies (4 local government and 6 state government) ... *"predicted benefit/cost ratios ranging from 1.2 - 5.6 for case studies producing effectiveness benefits. In other words for every dollar spent on running a GIS application the return on investment ranged from \$1.20 to \$5.60.* For the purposes of this study, effectiveness benefits were defined as arising when GIS is used to perform a task that could not or would not be done without GIS. The outputs are new or at least a significant improvement over existing products.

The Montana study also looked at efficiency benefits defined as arising when GIS is used to reduce the costs of a task that, in the absence of GIS, would be handled by some other method. The outputs must be equivalent. In a case study involving local government land records research the analysis predicted an efficiency cost/benefit ratio of 89%, or \$1.12 in benefits for each dollar invested.

Location or place is an important component of the vast majority of information which state and local government collects and uses in its day-to-day operation. This geographic/spatial component of information has become increasingly important as information technologies, such as Geographic Information Systems (GIS), have been developed to analyze and display information based on its location.

GIS-related technologies add a powerful package of tools to an organization's information technology capabilities because of their ability to integrate and analyze diverse types of information based on the physical location or proximity of the various features or characteristics. Because of these capabilities, many public agencies are choosing to invest in, or are considering investments, in GIS-related technologies. To insure the maximum overall return on these public investments, it is important that these agencies coordinate in the development and support of a common spatial data infrastructure. The development of a common spatial data infrastructure is the key to facilitating data sharing and integration through the implementation of data standards, and to minimizing the costly duplication of data development efforts.

LOCATION, LOCATION, LOCATION

According to the Urban and Regional Information Systems Association, more than 80 percent of all the information used by local governments is geographically (or spatially) referenced. Location or place is also an important component of most state data or information. Listed below, are a few examples from the 1993 Annual Report of the GIS Steering Committee, which highlight some of the areas of state and local government responsibility for which geographic/spatial data is very important.

³ Analysis of Geographic Information Systems (GIS) Implementations in State and County Governments of Montana. Logan McInnis and Stuart Blundell, Montana Geographic Information Council, Helena, MT, December 1998.

- There are approximately 950,000 property parcels in Nebraska, for which government agencies maintain land records, maps, and tax assessment information.
- The Nebraska Game and Parks Commission is responsible for the administration and operation of 87 areas of State Parks, Recreation Areas, and Historical Parks for a total area of approximately 149,163 acres. Game and Parks owns approximately 67,978 acres of wildlife lands and leases an additional 72,163 acres for fish and wildlife use.
- State and local governments are responsible for the maintenance of 9,949 miles of roads in the State Highway System and approximately 86,000 miles of county roads and municipal streets.
- There are approximately 24,000 miles of streams and rivers in the state. Nebraska Water Quality Standards for Surface Water have been defined for 13,000 miles of those streams.
- The Board of Educational Lands and Funds manages 1.5 million acres of school land.
- There are approximately 13,000 underground gasoline storage tanks across the state and roughly 2,500 of them have been reported as leaking.
- There are approximately 350 current and former, licensed and unlicensed, municipal landfills sites for which state government has regulatory responsibility.
- Nebraska lost an estimated 265.5 million tons of soil from water and wind erosion on crop and rangeland in 1987 alone. Government agencies have identified 9.6 million acres of "highly erodible land" that is farmed by approximately 63,000 producers scattered across the state. State government has committed itself to work with local farmers and local, regional and federal government agencies to significantly reduce this soil loss.
- There are 80,725 registered water wells in Nebraska. It is estimated that the total number of wells is at least twice that number (170,000), when you consider the unregistered domestic wells.
- Nebraska's three largest public power utilities (NPPD, OPPD and LES) maintain a total of approximately 23,500 miles of electrical power transmission and distribution lines.

Not included in the above 1993 list of example applications, is the growing use of GIS technologies to plan for and oversee the delivery of a variety of services to Nebraska citizens based upon the location of their residence or work. School buses are routed; health care, public safety and emergency services are planned; telecommunications services are provided; and legislative districts are defined based on where 100,000's of Nebraskans reside.

BENEFITS OF GIS-RELATED TECHNOLOGIES

In all of the above examples, government agencies are currently responsible for management, regulation, or other public policy decisions related to the large volume of information they collect and maintain on these features. In most cases, individual data elements or features have associated with them a multitude of related information that also needs to be stored, retrievable, and available for analysis. GIS is an information management tool that is capable of assisting government agencies to carry out these functions in a more efficient, effective manner. Because GIS helps to make this information more readily accessible, better management and public policy decisions can be made.

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Detailed cost/benefits studies of GIS implementation, such as the Montana study quoted at the beginning of this section, are fairly rare because of the complex and subjective nature of the benefits. However, there is a wealth of local and national anecdotal evidence about the merits of the technology, such as the Lancaster County Assessors Office report that the number of taxpayer assessment protest has decreased 66% in their office over the last 4-5 years. They attribute a significant portion of this decrease to their GIS, its contributions to improving their assessment database, and its capability to graphically display to taxpayers comparable property and sales in their neighborhoods. Or Lincoln Police Chief Tom Casady's statement, *"I would be hard-pressed to pick which is most significant, the value of GIS for crime analysis and targeting strategies, or the value of GIS for informing the general public"*⁴. Or Anita Bock who headed the Miami office of Florida's Department of Children and Families and now heads a similar agency in Los Angeles, *"I consider it to be one of the most significant things I've ever worked on. [GIS] absolutely revolutionized the way we did business."*⁴

As R.W. Greene noted in the introduction to a recent book, GIS in Public Policy,⁵

"GIS is not new to the world of government and public policy. But like other high-tech phenomena, it has for too long been viewed as the exotic realm of specialists. This is changing. The realization is growing that almost everything that happens in a public policy context also happens in a geographic one: transportation planners, water resources studies, education subcommittees, redistricting boards, planning commissions, and crime task forces all must consider questions of where along with the usual ones of how, and why, and how much will it cost. GIS, by answering the first question, helps to answer the others."

POWERFUL ANALYTICAL TOOLS

The availability of GIS has increased the importance and utility of the geographic component of the information that governments routinely collect and maintain. GIS adds a powerful package of tools to an organization's information technology capability because of its ability to integrate and analyze diverse types of information based on the physical location or proximity of the various features or characteristics. Many of the advantages of a GIS are unique to particular applications. However there are several general advantages that a GIS offers public agencies and institutions.

Integration of Different Types of Data Based on Location. A GIS provides the capability to bring together different types of information based on their proximity and to explore their interaction. For example, in researching ground water quality issues, information can be brought together on soil type, depth to ground water, fertilizer usage, cropping patterns, and irrigation usage to model the impact of irrigated, fertilized crops on ground water quality in a given area.

A Picture is Worth a Thousand Words. The ability of a GIS to graphically display (map) different features or characteristics, relative to their location, is a valuable tool in making an overall assessment of the implications of a particular set of information for public policy decisions or program planning.

⁴ Greene, R.W.. GIS in Public Policy ESRI Press, Redlands, CA. June 2000. p. 74.

⁵ Greene, R.W.. GIS in Public Policy ESRI Press, Redlands, CA. June 2000. p. xii.

Recording Changes and Keeping Maps and Records Current. The active link that a GIS allows between databases and maps greatly facilitates the maintenance of mapped information on dynamic features such as property parcels, etc. For example, with a GIS a County Assessor can, with relative ease, update a property parcel map with new information on an easement for a buried cable and tie that back to a database with the owner's information.

Enhanced Analytical Capabilities. A GIS provides a user with new enhanced analytical capabilities that would be difficult, if not impossible without this technology. For example, with the proper geographically referenced information, a GIS can very quickly determine which emergency unit should respond to an E911 (Emergency 911) call from a particular telephone number and the fastest route to take during rush hour traffic.

Facilitates Sharing of Information among Multiple Users. GIS facilitates the sharing and integration of geographically referenced information among multiple agencies or users. There are many applications that require common types of data (highways, streams, property parcels, etc.). A coordinated approach to GIS development would reduce the costs associated with the duplication of data development and maintenance by having one entity responsible for the development of a given type of data for a given area. This also has another benefit in that different public entities and agencies would be making and implementing public policy based on the same information.

BENEFITS OF A COMMON SPATIAL DATA INFRASTRUCTURE.

Because of the powerful analytical and communication tools provided by GIS technologies an increasing number of public agencies are very likely to be making public investments in this technology. *The primary focus of this strategic plan is not whether those individual agency investments should be made, but whether they should be made in a coordinated manner so as to maximize overall public return on those investments.*

The key to maximizing the overall return on public investments in GIS-related technologies is the cooperative development and maintenance of a common spatial data infrastructure. This perspective is widely shared nationally and was supported by the Montana cost/benefit study.

"Agencies need to establish internal and inter-agency agreements on data standards and data maintenance responsibilities prior to GIS implementation. The elimination of redundant data maintenance and adherence to common data standards will provide the largest economic gains in the long run."⁶

At the state, local and national level there is a fairly high degree of consensus on what constitutes the core elements of this common spatial data infrastructure. These core elements are designed to facilitate data sharing and integration and include:

- A select subset of standardized geospatial databases that are designed to provide the location, shape and core attributes of key features needed for a wide range of GIS applications (i.e., roads, streams, aerial imagery, surface elevation data, geodetic control, Public Land Survey System corners, property parcels, governmental unit boundaries).

⁶ Analysis of Geographic Information Systems (GIS) Implementations in State and County Governments of Montana. Logan McInnis and Stuart Blundell, Montana Geographic Information Council, Helena, MT, December 1998.

- Documentation of geospatial databases with standardized metadata (data about the data) to facilitate data sharing.
- A geospatial data clearinghouse to facilitate finding and accessing available geospatial database for given data themes and geographic areas.
- Overall coordinating institutions with the resources to facilitate communications, planning, and joint projects within the GIS user community.
- Data coordination entities to take responsibilities for specific core geospatial databases, including data distribution and on-going upgrading through the incorporation of the best available data from multiple geospatial data producers.

Framework Databases. At the core of the common spatial data infrastructure is a select subset of geospatial databases that have been identified nationally as key geospatial databases and are referred to as framework databases. These framework databases provide a foundation for the development of numerous other geospatial databases and a means for sharing and integrating these databases across a wide range of public and private sector applications. As such, these framework geospatial databases are fundamental components of an underlying information technology infrastructure that supports a wide range of applications for which geographic location is a key component of the information. Examples of these framework geospatial databases include: road networks, rivers and streams, section corners, property parcel boundaries, political boundaries, and geo-referenced aerial photography.

The development of this select set of framework geospatial databases, incorporating the database features and standards needed to address a wide variety of user needs, will require a significant up-front investment of public resources. However, such an investment in geospatial database infrastructure is a solid public investment because of the long-term public dividends that will result. Among these long-term dividends are the following:

- minimizes the duplication of effort by multiple agencies who otherwise would invest scarce public resources in the development and maintenance of similar sets of commonly needed geospatial databases;
- increases the sharing of geospatial data among agencies and levels of government by building a cooperative data-sharing culture and infrastructure based on shared data standards;
- facilitates the ability to integrate and analyze geospatial data related to a single geographic area, but originating from multiple agencies;
- facilitates the ability to piece together geospatial data from a variety of sources and from dispersed geographic areas into a coherent regional/statewide database mosaic; and
- enhances the quality of public policy decisions and the efficiency of service delivery due to the ability to integrate and analyze data from multiple public and private agencies.

While the development of this framework geospatial data infrastructure will require a substantial public investment, the lack of public policy decisions to make these infrastructure investments will likely result in higher long-term public costs. Absent a coordinated effort to develop and maintain these framework geospatial databases, a likely scenario is that multiple agencies will develop pieces of similar databases for their particular geographic area of need or responsibility. Even if consensus framework database standards already exist, there are likely to be numerous instances in which these framework database standards will not be followed.

Consensus framework database standards are designed to meet the multiple needs of a variety of potential users. In many cases, their full implementation will be more costly than the development of a similar database that is designed to meet only the needs of the particular agency that is actually producing the data. Without a cooperative database funding source that is tied to these framework database standards, it is unlikely that most local governments or state agencies will make a greater investment than that which would be required to meet the needs specifically related to their mission or area of responsibility. Thus, while each of these individual geospatial database development efforts may be less costly, the combined public costs of multiple databases of a similar nature that are likely to be developed for the similar geographic areas will likely be higher than a cooperative public investment made in the development of framework geospatial databases.

Added to these public costs associated with the development and maintenance of duplicate/similar geospatial databases for the same area, are the costs incurred when one can not easily integrate data from different sources because they were not developed with the same standards. One example of this might be the difficulty in integrating state and local road networks across county lines in the case of an emergency. Another example is the difficulty of integrating a state agency's surface water data with a local or federal agency's data for the same stream. The public costs in these situations would come either from the inability to respond in a timely, efficient manner to an emergency; the possibility of inappropriate public policy decisions made on surface water issues because of the inability to consider all the data; or through the costs of the personnel resources required for the on-going conversion of one or more databases, in order to integrate the data. In the case of framework databases, these indirect public costs are compounded because databases of these types are frequently used as a foundation for the development of numerous other databases, thus spreading this problem of database incompatibility.

A SOLID PUBLIC INFRASTRUCTURE INVESTMENT.

In summary, as the Montana GIS cost/benefit study concluded, *"The elimination of redundant data maintenance and adherence to common data standards will provide the largest economic gains in the long run."* The coordinated investment of public resources to develop and maintain a common spatial data infrastructure for Nebraska is a solid public investment that will pay long-term dividends to Nebraskans.

A NEBRASKA SPATIAL DATA INFRASTRUCTURE MODEL

GIS technology has potential applications in a very wide array of governmental and private applications and organizations. Because of the powerful capabilities of GIS and other geospatial technologies, many public agencies (state, local, and federal) are making investments in the technology and more will do so in the future. For government, one of the strengths of the technology is that it enables the sharing and integration of data and information from diverse agencies within a level of government, as well as, between levels of government. The economics of GIS data development costs provide strong incentives for data sharing and cooperative development efforts. Both the analytical potential and the economics of GIS data sharing necessitates a new look at how information technology, and information itself, has traditionally been used and developed within state, local, and federal government agencies.

DECENTRALIZED, BUT INTEGRATED

The implementation/use of GIS technology within Nebraska state and local governmental organizations should take a decentralized, but integrated approach, characterized by a distributed technology base with accessible/disseminated information. Implementation of a decentralized, but integrated GIS includes hardware, software, and peripheral equipment. However, the focal point must be on the information or data required. A decentralized, integrated network assumes that information and data bases reside in many locations, are developed and maintained by many organizations, and are accessible for use by other individuals and organizations. Integrated implies that data and processing, which is in numerous locations, is available to support multiple users at numerous locations.

DATA

Data Standardization. Some level of data standardization is integral to data sharing. To promote data sharing for GIS, data standardization is important for both spatial and non-spatial (tabular) data. Developing agreements on systems for data element identification (one well number, one highway numbering system, one county numbering system, one parcel numbering system, etc.) is one of the standardization elements, which would greatly facilitate data sharing. The collaborative development of widely-used, standard reference geospatial databases is another effective approach for developing and encouraging the adoption of data standards. Another key element is the development of standard methods of communicating, via accompanying metadata files, the characteristics of the data in the database. Future users must have methods to verify the suitability of the data for their intended purpose. The key is not to try to guarantee the suitability of the data for all future uses, but to provide sufficient accompanying metadata so that informed and logical choices can be made on the suitability of the data. Existing work by federal agencies in the area of metadata standards should be a foundation for Nebraska metadata standards.

At the state level, the GIS Steering Committee, the Nebraska Intergovernmental Data Communications and Advisory Council (NIDCAC), the Nebraska Information Technology Commission (NITC) and the affected agencies need to be involved in identifying a forum and leadership to coordinate a standardization process. Local governmental associations should be encouraged to be actively involved in this standardization process.

Framework Data. It is generally accepted within the GIS user community that there is a core subset of geospatial databases (transportation, streams, aerial photography, elevation, political boundaries, cadastral, etc.) that are needed by a wide variety of GIS users and applications. Because of this broad-based need, there is a solid economic case for the cooperative development and maintenance of these databases, known collectively as framework data. The cooperative development of these framework databases will eliminate the costly duplication-of-effort involved in multiple users developing similar databases. The development of standardized framework databases also facilitates data sharing and data standardization as multiple users incorporate these databases and their cooperative standards into their operations. Framework databases are an integral part of the spatial data infrastructure and their cooperative development and maintenance should be a primary focus of coordinated GIS development.

Data Collection. Data collection should be done by an entity, which has expertise in the subject. It is not efficient or effective to encourage or allow collection of the same/duplicate data by numerous entities. The data should be collected at sufficient accuracy and volume to support, where reasonably feasible, the most discriminating user. The cost of data collection should be shared based upon the frequency of use and requirements of the end users. No user should be required to pay for more accuracy or volume than their requirements would dictate, but the accuracy and volume should be available to all users. In this case, an infrequent or small volume user would not be able to dictate unreasonable requirements for the data unless they were able to justify the expense and provide funding for the additional collection costs.

Responsibility for creating the data needed for this decentralized, but integrated system needs to be addressed. State agencies with specific responsibilities for maintaining unique spatial and/or non-spatial databases should continue to develop, maintain, and make accessible, those databases specific to their area of responsibility and expertise. For multi-application, statewide GIS databases, the GIS Steering Committee should play a role, if not take outright responsibility, for seeing that these statewide databases are developed, and developed well. However, for many databases, the detail and accuracy requirements for the data will, in general, be the highest at the local level. This reality provides a strong argument that much of this data development should be done at the local level. These detailed data sets could then be provided to other users, at a lower level of detail if necessary. It would be more difficult, and more expensive, to take a more generalized data set developed by a state or federal agency and generate the greater detail required by the local users.

In many cases geospatial data collection efforts will involve partnerships between agencies at the same or different levels of government. Flexible institutional structures should be created to assist the GIS Steering Committee in facilitating the development and operation of these partnerships. Many geospatial databases are dynamic in nature and will require on-going maintenance or updating. In many cases this updating will involve multiple partners or data sources. The GIS Steering Committee should designate one agency for each core data theme to be responsible for on-going data integration.

Managing Data Development Priorities. As the use of GIS-related technologies grows, public agencies at the state, local and federal level will be making large public investments in the development of geospatial databases. An important public policy issue is how these investments of individual agencies can be shaped so as to achieve a maximum overall return, by meeting not only the needs of specific agencies, but also those of the wider public GIS user community. With state agencies, the budget process is one area in which predetermined data development priorities could be encouraged/controlled. A potential area of oversight would be

to include "significant" database development in the items reviewed by the GIS Steering Committee.

State government, however, has no budgetary control over data development decisions by local government. How does the state influence what data is developed at a local level? One alternative, is a funding mechanism similar to the one developed by the State of Wisconsin, which would provide some means to facilitate and influence data development at the local government level. Such a system involves a fee structure, with the revenue going into a GIS/data development fund. This fund is under the control of a Land Information Board (including representatives of state and local government) and is distributed to local governments based upon an application and review process. Such a system would provide a means to facilitate data development at the local government level and a means to influence the priorities of that development.

Managing Data Access and Facilitating Data Sharing. In most cases, data should reside with the entity, which is responsible for its collection and/or maintenance. By maintaining a single point of read-only access (on- or off-line) for each dataset the responsible entity can insure that other potential users are always accessing the most current data available. In situations where multi-application databases are jointly developed by two or more entities, control/responsibility for the databases and their maintenance should be arranged in advance, by mutual agreement of the developing parties. Databases developed with GIS Steering Committee participation should reside on a system, which is networked and accessible through networks such as Internet and/or the state Wide Area Network (WAN).

To facilitate data sharing, the GIS Steering Committee should maintain and/or promote a high-visibility geospatial data clearinghouse, through which users could search for available geospatial data related to Nebraska. Available geospatial data should be documented by standardized metadata and referenced through the clearinghouse based on this metadata. To further facilitate data sharing, one common geospatial data sharing cooperative agreement should be developed and promoted among all public agencies.

GIS PROCESSING CAPABILITY

Most, if not all, users would have some level of GIS processing in-house. In some instances, this may consist of only GIS viewing/analyzing software similar to ArcView[®] or GeoMedia[®]. There could be additional processing power available through other entities by means of memorandums of agreement or contacts. This would allow the smaller users into the system without purchasing processing power for their largest projects. It is not usually cost effective to purchase equipment and/or software to handle projects, which are done infrequently. Larger entities would be able to purchase sufficient power to process their largest projects and then contract for use to the smaller users thus subsidizing their purchases yet allowing them sufficient power to support their largest projects which they may also do infrequently.

Technical assistance should be available for public entities wishing to explore the possibility and merits of utilizing GIS capability in their operations. This technical assistance should provide information to potential users on what systems might be cost effective to purchase and what services would be cost effective to obtain from existing systems. The management of technical assistance services by GIS Steering Committee is consistent with its mission and could foster cooperation, and minimize competition, within the GIS community by providing a neutral party for this role.

GIS Service Bureau. With the growing interest in the use of GIS technologies by a broader array of state agencies, the establishment or designation of a GIS Service Bureau for state government should be considered. The intent of establishing such a service bureau would not be to centralize all GIS services, but to provide agencies with an alternative for securing new or additional GIS services instead of the necessity of adding technical staff and/or capabilities directly to their agency's operation. Such a service bureau could, upon request from a state/local agency, assist in the development and analysis of geospatial data, the development of specialized GIS applications, and the utilization and customization of geospatial tools. The availability of such a service bureau would lower the threshold for new agencies to utilize the technology and enable existing users to undertake large, short-term, development projects without the need to expand existing capabilities. A GIS Service Bureau could also provide needed operational support for implementing the GIS Steering Committee's coordinated development priorities and should be closely associated with the Steering Committee for this purpose.

Regional Service Centers. GIS and associated geospatial technologies have a wide range of potential applications for local governments. Because of the power of the technology, local governments in the more populous areas of Nebraska are moving to adopt the technology. There is also interest in this technology in many of the local governments in the less populous areas, but most lack the financial and technical resources to implement the technology. Cadastral data (property parcels) is one of the framework databases that is widely needed by state, local, regional and federal agencies. Property ownership data is dynamic data that flows through local government institutions. If these land ownership records are to be made more accessible through current technologies, this modernization must be done in close association with the local governments. To assist local governments in the less populous areas to implement this technology and thereby make land ownership data more widely available, state government should consider partnering with local governments to develop regional professional service centers. These regional professional service centers could work with local governments and other public entities to aggregate and provide for their surveying, mapping, GIS, and the possibility other professional service needs.

SYSTEM COMPATIBILITY

Computer-related hardware compatibility is becoming less of a concern every day. The review of GIS-related agency technology plans and grant requests by the GIS Steering Committee, upon request from the NITC, ensures a large degree of hardware compatibility for state agencies. For non-state agencies, the GIS Steering Committee should outline the benefits of an integrated approach and clearly define what it requires to access the integrated system.

COORDINATION / MANAGEMENT

Some level of coordination will be needed in a decentralized, but integrated approach to GIS development. Control needs to be diverse to promote non-political solutions, yet contained to facilitate rapid and accurate decisions. The Steering Committee is suited for this purpose, but it is currently lacking in staff and support.

The tools available to the Steering Committee must be enhanced, if the Steering Committee is to adequately address its statutory responsibilities and provide coordination for the growing and diverse GIS user community that is making public investments in this technology. In most

cases, the question is not whether these public investments in GIS will be made; the question is whether they will be made in a coordinated manner so as to maximize overall public return on these investments through the support of a common spatial data infrastructure. The following initiatives would strengthen the ability of the Steering Committee to provide this coordination.

Collaborative Database Development Fund. The establishment and funding of a Collaborative Geospatial Database Development Fund would provide the GIS Steering Committee with a tool to proactively influence agencies' GIS database investment decisions. Such a fund could be used to provide seed money to leverage existing agency funding to support the cooperative development of standardized, priority geospatial databases needed by the broader GIS user community.

State & Local Partnerships. The modernization of local government land records presents a special challenge for coordinated GIS development. Property parcels and associated land record databases are needed by a variety of public agencies, at all levels of government. Many of the local governments in the less populous areas do not have the financial or technical resources to implement this technology by themselves. It is in the state's interest to work with local governments and quasi-government entities to develop mechanism whereby the state can partner with and assist local governments to make their land records more accessible by modernizing their land record information systems. To be effective, such state/local partnership should include:

- Funding assistance to local government dedicate to land record modernization efforts;
- Adherence to statewide standards;
- Coordination at the local government level; and
- Coordination at the state level through the GIS Steering Committee and the NITC.

Data Development Partnerships. In many cases geospatial data collection/development efforts could involve partnerships between agencies at the same or different levels of government and/or private or quasi-private enterprises. Flexible institutional structures should be created to assist the GIS Steering Committee in facilitating the development and operation of these partnerships.

GIS Education/Outreach Program. In a decentralized, but integrated GIS environment, investment decisions related to GIS will be made by public officials in a wide variety of agencies and levels of government. In many cases public officials will have very limited technical knowledge upon which to base their investment decisions. These public officials will also have limited knowledge of the potential for partnerships with other agencies needing similar data or applications. To maximize the return on these investments, the GIS Steering Committee should conduct an outreach / education program to assist public officials in researching and planning cooperative GIS implementations and geospatial data development projects.

STRATEGIC DIRECTION

The initial step in developing a strategic plan for Building a Spatial Data Infrastructure for Nebraska was to define the long-term or strategic business direction from which to identify specific projects. This section of the plan defines the mission and goals for future GIS development and utilization in Nebraska.

INTRODUCTION

The purpose of this section is to present a blueprint for areas of focus to achieve a desired future for GIS development and utilization in Nebraska by outlining strategic goals for GIS development. The remainder of this section is organized under the following headings:

- Mission - An overall statement of the desired result of the Nebraska GIS planning effort.
- Goals - A series of goals that briefly state the desired direction of GIS development and implementation.

The goals described in this section were defined by the Nebraska GIS Steering Committee and were then used as the basis for defining the specific initiatives outlined in the following Strategic Initiatives section of this document.

NEBRASKA GIS STEERING COMMITTEE MISSION

The Nebraska GIS Steering Committee has defined a mission statement to serve as a guide for its work. This same mission statement served as the guide for this strategic planning effort.

The mission of the Nebraska Geographic Information System Steering Committee is to encourage the appropriate utilization of GIS technology and to assist organizations to make public investments in GIS technology and geospatial data in an effective, efficient, and coordinated manner.

GOALS

Within in the context of the Steering Committee's mission statement and this strategic planning process, the GIS Steering Committee updated and revised its long-term goals for coordinated GIS development. The goals define the desired long-term characteristics of the future coordinated development and implementation of GIS in Nebraska and, when possible, provide the evaluation criteria or methods by which the community can determine if progress has been made in achieving the defined mission.

Goal #1 Priority Databases. *Coordinate the development of widely needed digital geospatial databases in a standard reference format and establish systems for the on-going cooperative maintenance and enhancement of these priority geospatial databases.*

A core subset of geospatial databases (roads, streams, governmental boundaries, aerial photography, etc.) are needed by a wide range of state, local and federal government agencies and private entities. The cooperative development and maintenance of these core databases is the most cost-effective means of providing these databases. These core databases also provide the framework for the development of numerous of geospatial databases. The cooperative

development of standardized framework databases will minimized costly duplication of effort, facilitate data sharing and minimize costly data integration problems due to incompatible data.

Goal #2 Land Records Modernization. *Promote and facilitate local government land record modernization and GIS development.*

One of the most promising and cost-effective application areas of GIS technology is the modernization of how local government land records are maintained and accessed. In addition to land record modernization, there are numerous other potential local government applications of GIS technology (emergency response, public health and safety, zoning, taxation, street and utility maintenance, etc.) The land record information maintained by local governments is also one of the framework geospatial databases that are needed by a wide variety of state, local and federal agencies and private entities. It is in the interest of the broader GIS community that this land record information be developed in a standardized geospatial format that is accessible to multiple users at the local, state and federal level. Because of the limited resources at the local government level, partnerships will be necessary in many areas to facilitate the development and maintenance of this data.

Goal #3 Technical Assistance. *Provide technical assistance to local governments and state agencies.*

With the growing interest in GIS technology, it is no longer just being used by a limited number of fairly large public agencies. It is becoming a powerful mainstream information technology, with a wide variety of state and local level agencies either developing or having an interest in developing GIS applications. With this growing interest in the technology, there is a parallel growing need for technical assistance to help these agencies develop their GIS/geospatial data or applications. These technical assistance needs range from guidance in designing and planning the development of an in-house capability; to specialized GIS application development; to large-scale geospatial data development projects; to on-going development and maintenance of specific GIS applications. Up to this point, the primary operational model in Nebraska has been for each agency or local government to develop and maintain its own in-house GIS capability. With more and more agencies expressing interest in the technology, it is time to consider the merits and efficiencies that might be gained by arrangements to aggregate the demand and resources available to support these technical services.

Goal #3 Education/Outreach. *Promote an educational outreach program designed to maximize the overall return on public investments in the development of geographically referenced databases and GIS systems by providing educational materials, presentations and coordination services to the public officials and technical staff who will be making these investment decisions.*

While GIS can no longer be considered a new technology, it is still new and relatively complex for many of the agencies and policy makers who are now considering their initial public investments in the technology. Without education and/or technical assistance these public sector decision-makers can easily make costly mistakes in their initial GIS investment decisions. The risks of costly mistakes have less to do with the hardware and software, and more with data purchase or development decisions. Public investments in a GIS educational/outreach program, directed toward government decision-makers, will increase the probability of wise public investment decisions in GIS technology. Such an education program will increase the

likelihood that costly geospatial databases developed for one area and application, will not only work as intended for that application, but also for other areas and applications. Such an education/outreach program is a vital component of a coordinated GIS development effort.

Goal #4 Data Sharing and Distribution. *Develop structures, standards, and processes that facilitate easy access to, integration, and usability of publicly available geospatial data.*

A key component of any coordinated GIS development strategy must be the development and maintenance of mechanisms to facilitate the sharing of commonly needed geospatial data. There are several essential elements to such a data sharing strategy. These include the easy ability to discover the existence of data and how it is accessed. The documentation of the data to facilitate its proper use is another essential element, as is the establishment and wide implement of data standards to facilitate data integration. Geospatial data users and types of data are diverse and data sharing strategies must address this diversity of users and needed data (natural resources, demographics, land records, transportation, utilities, city/regional/state/federal, etc.)

Goal #5 Strengthen Coordination Capacity. *Strengthen the GIS Steering Committee's capacity to facilitate the implementation of priority geospatial database development decisions, data sharing, interagency/intergovernmental partnerships, and agencies' utilization of GIS technology.*

While Nebraska statutes define broad areas of responsibilities for the Nebraska GIS Steering Committee, the Committee has very little in the way of independent authority and/or resources to seriously address those responsibilities. With limited authority and no operational capability or budget, Steering Committee decisions and priorities can only be implemented through the sponsorship and active support of independent state, local or federal agencies. The coordination of GIS development for the overall good of the broad and growing Nebraska GIS user community is a unique and challenging mission not specifically shared by any other public entity. In some specific instances other agencies' missions and priorities are congruent with those of the Steering Committee and in those cases those agencies may take the lead on a project on behalf of the Steering Committee. However, where this parallel sense of priorities does not exist, the Steering Committee is seriously limited in its ability to implement its priorities. Many of today's major geospatial data development efforts are only feasible through intergovernmental partnerships. The Steering Committee's structure is poorly suited to facilitating the actual implementation of those partnership projects. The availability of seed funding specifically dedicated to collaborative GIS development efforts and the ready access to institutional channels whereby the resources from intergovernmental partners could be efficiently combined and leveraged would enhance the Steering Committee's ability implement collaborative GIS development projects.

STRATEGIC INITIATIVES

Achieving the previously noted vision and goals for the coordinated development of a common spatial data infrastructure requires that action be taken to improve the current situation from both a short- and long-term perspective. Provided below are descriptions of the strategic, or long-term, initiatives that would move the GIS user community toward the desired future system vision. These initiatives include:

- Priority Database Development and Maintenance
- Land Record Modernization
- Technical Assistance
- Education and Outreach
- Data Sharing and Distribution
- Strengthen Coordination Capacity

INITIATIVE 1 — PRIORITY DATABASE DEVELOPMENT AND MAINTENANCE.

Coordinate the development of widely needed digital geospatial databases in a standard reference format and establish systems for the on-going cooperative maintenance and enhancement of these priority geospatial databases.

A core subset of geospatial databases is needed by a wide range of state, local and federal government agencies and private entities. The cooperative development and maintenance of these core databases is the most cost-effective means of providing these databases. These core databases also provide the framework for the development of numerous of geospatial databases. The cooperative development of standardized framework databases will minimize costly duplication of effort, facilitate data sharing and minimize costly data integration problems due to incompatible data. In addition to the specific database development projects outlined under this initiative, the collaborative database development fund proposal outlined under the initiative to strengthen the GIS Steering Committee's coordination capacity is particularly relevant to this database development initiative. The specific proposed projects under this initiative include:

SURFACE WATER FEATURES DATABASE

Develop a statewide standard reference dataset for surface water features following the model for a High Resolution (1:24,000) National Hydrography Dataset (NHD) with common feature identifiers for all surface water features; and a proposed process for its on-going cooperative maintenance and enhancement.

Why it is a priority. Geospatial surface water databases have been prioritized for development by Nebraska GIS Steering Committee and the Federal Geographic Data Committee because they are among a select subset of framework databases that provide basic data infrastructure for a wide cross-section of GIS applications and geospatial data users. In response to the wide array of needs for water-related databases, the Nebraska GIS Steering Committee authorized the formation of an interagency Water Resources Database Advisory Committee in late 1998 to study the issues and make

recommendations. This Advisory Committee identified 26 water-related, geospatial databases and, of those 26, ranked a surface water features database as its highest priority for development.

Because of the importance of surface water to Nebraska, numerous state, local and federal agencies collect, analyze, and use data related to surface water features (rivers, streams, canals, lakes, wetlands, etc.). These various uses relate to:

- the implementation state statutes and regulations,
- the shaping of state and local public policies,
- the promotion of public health and safety,
- the allocation of public resources,
- the delineation of private rights, and
- the provision of general public information.

At the present time, there is no statewide, digital, surface water features geospatial database available that is sufficiently comprehensive, current, and at a scale of spatial accuracy and detail to serve as a standard reference database for these wide-ranging applications.

To illustrate the need for a standard reference, surface water features, geospatial database, some examples of the broad range of potential applications of are provided below.

Floodplain Mapping. The Floodplain Management Division of the Dept. of Natural Resources (DNR) is currently working on a project "Large Area Floodplain Mapping Initiative" that could utilize a statewide, high quality vectorized stream coverage at a scale of 1:24,000 or better. Currently, this initiative utilizes Digital Elevation Models (DEM) and Digital Orthophoto Quads (DOQ) databases along with existing hydrologic and hydraulic information, and other engineering computations required to map 100-year floodplains throughout the state. The computation process requires accurate stream lengths and slopes along the stream reaches, which is not adequately provided by the DEMs. Other sources of information, such as TIGER line files, also do not provide the necessary accuracy for this project.

Water Rights. An accurate and complete 1:24,000 NHD type spatial database of streams would also be used in DNR's water rights mapping program. The Department has set a goal to digitize its water rights maps. An accurate stream, lake and reservoir network would be an important element in those maps. It would also be useful to tie in our downstream order scheme to stream ordering schemes used by other agencies. The stream reach coding implemented in the NHD projects would be useful for this purpose.

Other Likely DNR Uses. Such a database would allow DNR's Dam Safety Program Engineer to enhance his dam site maps. The ground water registration section may be able to use it as a tool to identify wells in close proximity to a stream; which would require the well owner to obtain a surface water permit. The database would also be useful in scientific and administrative programs dealing with interstate compacts and litigation support, as well as, watershed planning, terrain modeling and other project studies.

Standard Reference for Surface Water Sample Sites. The Central Platte Natural Resources District sees such a database as useful for providing standard reference numbering and locations for stream water flows and water quality samples that the NRD

collects. It also offers a potential approach for numbering and locating stream cross sections and profiles.

Drainage Basin Characteristics. The Central Platte NRD also sees that such a database may provide a means to develop drainage basin characteristics above various locations in the river basin. For example, pick a highway or county bridge crossing on a stream what is the drainage area, average slope, centroid of basin, 100-year flood hydrograph, etc.

Fisheries Management and Enhancement. The Fisheries Division of the Nebraska Game and Parks Commission (NGPC) would use this data for species mapping and watershed analysis around state lakes. Watershed planning is important to maintain the quality of fisheries in state lakes. A better definition of stream networks, water bodies, and watersheds within the area around state lakes would be beneficial to this effort. Presently existing databases of stream conditions collected by field personnel could be referenced to such a standard reference database. Some of the data that is collected is on water courses that are not represented in existing GIS databases and if existing, the Fisheries Division would utilize this data.

Wildlife Management and Protection. Good representation of stream networks would allow the NGPC to better map the locations for Threatened and Endangered Species and non-threatened species. Attribute information on perennial/intermittent status and accurate stream name attributes would be useful for these efforts. Canals locations and attribute information should be included in the data set as well. An improved stream network would allow stream flow modeling for both wildlife and fisheries.

Enhanced Lake Information. The NGPC Parks Division would use improved lakes coverages for mapping in State Recreation Areas and State Parks. The Wildlife Division would benefit as it relates to Wildlife Management Area locations. The Fisheries division would use this data set for species mapping and watershed analysis around state lakes.

Standardized Stream Segment Delineation and Identification. Stream segment delineation contained in Title 117 - Nebraska Surface Water Quality Standards is based on the information contained on USGS 1:24,000 scale quad maps. If the Department of Environmental Quality (DEQ) is to use GIS tools in describing or implementing T117, geospatial data based on the 1:24,000 scale maps would be preferable.

Surface Water Quality Enforcement. DEQ's water quality assessments are based on sampling to represent entire segments. Similarly DEQ's reporting reflects the support or non-support of uses assigned in the Standards. They report their results as miles of streams supporting, which segments support, acres of lakes, which lakes support, etc. EPA requires this method of reporting for their programs. Since the basis of DEQ's reporting units are the waterbodies identified in T117, use of a 1:24,000 scale coverage would be preferred when using GIS in this activity.

Total Maximum Daily Load and Waste Load Allocations Permits. The Total Maximum Daily Load calculations (TMDL) and Waste Load Allocations for the DEQ permits program relies on hydrology variables as input to the modeling process in addition to the linear routing. Some of these variables would be included in a GIS data layer or could be associated with such a data layer. Since the basis of DEQ's authority for these permits

relies on T117, use of a 1:24,000 scale coverage would be preferred when using GIS in this activity.

TMDL for Non-point Source. DEQ's TMDL efforts for the nonpoint source program uses similar information as outlined above for stream segments, except in a non-regulatory manner. The same rationale for needing 1:24,000 scale coverage holds for the nonpoint source program.

Bridge Design. The Bridge Division of the Nebraska Department of Roads anticipates the use such a surface water database in the hydrologic modeling they do related to the design of bridges. An accurate depiction of the current location and shape of the stream bed, combined with Digital Elevation Models (DEMs) and a logically connected stream flow network would enhance their ability to conduct upstream flow analyses.

Surface Water Buffer Strips. The Department of Agriculture is charged under the Buffer Strip Act, (2-5101 to 2-5111) to devise and oversee implementation of a statewide vegetative buffer strip plan for the areas around surface water features with the goal of improving the quality of the domestic and public water supply. The Natural Resources Conservation Service - USDA is also actively seeking to incorporate such buffer strips into their farm conservation plans. A high-resolution surface water features database would be a valuable tool to assist in prioritizing areas and monitoring the impact of these programs.

Where we are now. The absence of a standard reference, surface water features database is costly from both a program implementation and public policy development perspective. The absence of a high resolution surface water database make it difficult to conduct a variety of geospatial analyses that would otherwise assist numerous public projects and public policy considerations. An array of state, local and federal agencies currently collect data related to surface water features and presently index that data with a variety of independent stream segment and water body identification schemes. The absence of a common identification scheme for a given surface water feature makes it difficult and costly to cross-reference this data with other agencies and programs.

An interagency Working Group was established by the Water Resources Database Advisory Committee to research and develop an action plan to address the need for a standard surface water dataset and it recommended the development of a dataset based on a model developed by the USGS and EPA. The USGS/EPA database model, known as a *National Hydrography Dataset (NHD)*, was designed with the goal of developing a model for surface water geospatial databases that could serve as reference databases for a wide variety of applications. The Working Group also recommended that to serve most state and local surface water database needs, a Nebraska NHD should be developed at a 1:24,000 map accuracy level. Current USGS/EPA efforts are focused on developing NHD at 1:100,000 map accuracy levels (± 40 ft. versus ± 167 ft.).

The Working Group and Advisory Committee recommended undertaking an NHD pilot project to lay the foundation for the development of a statewide dataset. Based on these recommendations, the Nebraska GIS Steering Committee passed a resolution encouraging agencies to explore the possibilities for supporting cooperative efforts to undertake a 1:24,000 NHD pilot project.

Where we are going. In February 2000, a work share pilot project agreement to develop a high resolution (1:24,000) NHD for one of Nebraska's watersheds was signed between the USGS and the following state agencies: NDWR, NNRC, NDEQ, and NGPC. That pilot project is currently underway, with the newly merged Nebraska Department of Natural Resources acting as the lead agency.

One specific objective of the pilot project is to develop a 1:24,000 NHD for one Nebraska watershed. Other pilot project objectives are to establish baselines for future statewide development efforts, by determining the optimum methodology, the approximate costs, and the database features and standards that would facilitate its use by a wide variety of state, local and federal agencies.

The pilot project is intended to lay the foundation for ultimately developing a statewide, standard reference, surface features database based on the NHD model, but at a higher level of spatial accuracy and resolution. Based upon the recommendations of the Working Group, the following features will be incorporated in this Nebraska NHD and will make it particularly well suited to serve as a standard reference geospatial database of Nebraska's surface water elements suitable for use in a wide range of applications.

- Digital mapping representation of all surface water features found on standard 1:24,000 USGS topographic maps, including scale-appropriate banks of rivers and lakes.
- EPA Reach Codes applied as permanent feature identifiers to every river and stream segment (reach).
- The hierarchically coding scheme of the EPA Reach Codes provides a basis for data retrieval and analysis based on the network relationships between reaches.
- Common names for rivers and streams provided as an attribute to stream segments (when available).
- A logically connected "centerline" network through all hydrologically-connected, surface water features, including artificial paths through open water bodies, to facilitate upstream/downstream hydrologic modeling.
- A spatial accuracy of water features comparable to a 1:24,000 scale map (± 40 ft).

How we will get there. The development of a high-resolution, surface water features database for Nebraska will pay long-term dividends for Nebraska, however, it will require a sustained, cooperative, multi-agency effort, over several years to accomplish. Using the U.S. Geological Survey's current cost estimates, it would cost approximately five million dollars to contract with private vendors to develop a comprehensive set of updated digital maps of all the rivers and streams in Nebraska. Added to these mapping costs, are the costs associated with incorporating into the database the special attribute features of the NHD, which is what makes it such a powerful multi-purpose standard-reference database. The USGS-based rough estimate for these costs is approximately \$700,000. Assuming that they have the funds available, USGS is potentially willing to do a 50/50 cost share on both of these development costs. It is hoped that these costs can be substantially reduced by approaching this project through an interagency work share agreement.

When the Logan Creek NHD pilot project is completed, an effort will be made to draw upon this interagency experience to design a cooperative, interagency effort to develop a statewide NHD database over the next several years. Interest in the pilot project would

suggest the possibility of support for such a statewide effort from at least the following agencies: DNR, DEQ, GPC, DOR, USGS, and NRCS. In designing this cooperative development program, an effort will be made to first leverage existing technical resources from within state and federal agencies. Second, efforts will also be made to explore the possibility of existing of federal or state grants or other funding that might be applied to supporting this development effort. If these sources prove to be inadequate to develop this importance database in a timely manner, consideration will then be given to requesting special state funding for this important spatial data infrastructure development project. This multi-agency database development project is a perfect example of the need for the Collaborative Database Development Fund that is outlined under the *Initiative 6 ¾ Strengthen Coordination Capability*. Depending upon the resources available, it is estimated that this multi-agency, statewide database development effort could require 4-5 years to complete.

GROUND WATER FEATURES - WELLS

Develop a standard, cooperative system for uniquely identifying water wells, indexing data related to those wells, and for progressively enhancing the available information on the location of each water well.

Why it is a priority. As noted above, in late 1998 the Nebraska GIS Steering Committee authorized the formation of an interagency Water Resources Database Advisory Committee to study the need for water-related geospatial databases and make recommendations. The Advisory Committee identified 26 water-related databases needed by the interagency Committee members. Of those 26, the Advisory Committee ranked the surface water features database outlined above as its highest priority, and the groundwater/water wells database as its number two priority for development.

Because of the importance of water to Nebraska, numerous state, local and federal agencies collect, analyze and use data related to water wells and the associated groundwater. As a result of a variety of programs in different agencies, a large volume of data related to wells and groundwater has been collected, and continues to be collected. Unfortunately, the lack of a universally applied water well identification scheme makes it very difficult and costly to integrate this data across the different programs and agencies. For many programs, enhancing the ability to share, integrate and analyze groundwater data across programs and agencies would provide a more cost-effective way to achieve program goals and to monitor program results.

Personnel from a given agency frequently need to make repeat visits, over a period of time, to a particular well to collect water samples. In some areas, there are numerous wells located in close proximity to each other without obvious physical features to make them uniquely stand out. Absent a unique identifier placed on a particular well, it is sometimes difficult to insure that agency personnel are indeed getting repeat samples from the same well. This difficulty is compounded if the sample visits are separated by several months of time and/or made by different personnel from the same agency. This difficulty is further compounded when one attempts to integrated data collected from supposedly the same well by multiple agencies, without the benefit of a unique well identifier placed on that particular water well to provide a common unique reference.

In a similar manner, accurate information on the location of water wells is increasingly important to many programs. The water well locational data most readily available to most users is from the Registered Wells Database, which contains information on over 100,000 registered wells and is maintained by Dept. of Natural Resources (DNR) (formerly DWR). In most cases, this locational data was derived from mathematical estimates based on the center of PLSS sections or distances from the PLSS corners, as recorded on the well registration form. For many of today's applications, this locational information is not sufficiently accurate, particularly when there are multiple wells in relatively close proximity.

Where we are now. Over a period of years, different agencies have developed and maintain separate identification schemes that are used to index the water well and groundwater data they collect and maintain. Because a common water well identification scheme is not universally applied to this data, it is very difficult and costly for programs that wish to integrated this data across agencies, programs and/or time. The closest approximation we have to a universal well identifier system is the Registered Well ID maintained by DNR. Unfortunately, many wells are not currently registered. Even when they are registered, it is very difficult to determine the registered well ID when one is in the field taking samples, as there is no identifier placed on the well itself. Because of this problem, a few NRDs have begun to place their agency-specific identifier tags on wells as they visit them in the field.

Because of the growing importance of having relatively accurate information on well locations, many agencies are now investing public resources to use Global Positioning Satellite (GPS) technology to collect more accurate locational coordinates on water wells. Unfortunately, there is currently no systematic, interagency program in place to make this more accurate locational information collected on specific water wells generally available to the broader user community.

Where we are going. An interagency Working Group was established by the Water Resources Database Advisory Committee to research and develop an action plan to address the need for a standard reference water well database, with enhanced locational coordinates for wells. That Working Group initially focused on the challenge of making enhanced data on the location of water wells available to the larger user community. A survey of state, local and federal agencies, discovered that GPS readings had already been collected on over 17,500 wells by NRDs, HHS, DEQ, and USGS, with future plans of collecting GPS readings on over 6,500 wells/year. The problem was lack of any systematic method for making the results of these individual agency efforts available to the larger community. The Group developed consensus methodologies for documenting how enhanced locational data on wells was derived and general conceptual agreement for procedures to integrate this data into the Registered Wells Database maintained by DNR. The Nebraska GIS Steering Committee passed a resolution supporting the Working Group's recommendations and urging agencies' support for their implementation.

The Working Group is also looking at the difficulty of integrating existing water well-related databases across agencies and programs. The Group has determined that the key to overcoming this is the implementation of a standard water well identifier that could be used to cross-reference the various databases. The Group has also determined that for such a common identifier system to be successful implemented, it is important that this common, unique well identifier be physically attached (tagged) to the well to provide a

means for the various agencies to collect and then enter this well identifier into their databases as they visit the well sites. The Group's draft recommendations suggest that the most effective and practical first step is to require that such an identifier be placed on all new wells before they are registered. The Group's draft recommendations also suggest coupling this tagging of new wells with an effort by state and local agencies to tag existing wells, as those agencies visit the well sites in the course of their regular work. These draft Working Group recommendations are currently being circulated to potential participating agencies for their response.

How we will get there. So far the majority of the responses received back on the Working Group's draft recommendations have been positive, as they related to the basic concept of placing an identifier tag on wells and getting GPS coordinates. However, there have been some reservations expressed and procedural variations proposed. Over the next several months, the Working Group will seek to stimulate further dialogue within the various communities (well drillers, NRDs, etc.) that would be the most impacted by these proposals. If, after this dialogue, there appears to be sufficient support, draft legislation will be prepared by July/August of 2001. DNR estimates that this project would require approximately \$50,000 per year for FY 2001-2003 of existing resources.

AERIAL PHOTOGRAPHY

Develop an updated statewide dataset of terrain-corrected (ortho-rectified) aerial photography at a 1:12,000 scale based on 1999 imagery; and a proposed process for its on-going cooperative maintenance and enhancement.

Why it is a priority. Geo-referenced aerial photography datasets have been prioritized for development by Nebraska GIS Steering Committee and the Federal Geographic Data Committee because they are among a select subset of framework databases that provide basic data infrastructure for a wide cross-section of GIS applications and geospatial data users. In response to the wide array of needs for geo-referenced aerial photography, the Nebraska GIS Steering Committee authorized the formation of an interagency Advisory Committee on Orthoimagery and Elevation Databases in late 1998 to study the related issues and make recommendations. Orthoimagery refers to aerial photography that has been geo-referenced and corrected for errors due to camera angle and terrain displacement.

Orthoimagery is used as a base map for a wide variety of GIS and geospatial analyses. Because all of the points on orthophotos are geo-referenced, it can be used to collect the shape and approximate locational coordinates of any surface feature that can be seen in the photo. This characteristic of orthophotos makes them a very cost-effective means for deriving other needed geospatial databases. Orthoimagery also provides a valuable visual backdrop for many abstract GIS maps and analyses and as such provide an important real world context for an abstract map. The following are some examples of the DOQ applications.

Where we are now. As a result of a three-year partnership agreement between the Nebraska Natural Resources Commission and the U.S. Geological Survey (USGS), a statewide dataset of 1:12,000 scale Digital Orthophoto Quads (DOQs) was completed early in 1999. This highly successful effort produced statewide, terrain-corrected, geographically-referenced, digital aerial photography with a spatial accuracy of ± 33 feet

for major surface features. The source data was 1992-93 aerial photography collected under an interagency federal program. The orthophotos produced from the 1992-93 imagery are available from the Natural Resources Commission (now DNR) at very limited or no costs, depending on the means of distribution, and there has been considerable demand for these datasets since their development.

Where we are going. In 1999, several federal agencies cooperated in contracting for statewide flights to collect new aerial photography for geographic area of Nebraska. The GIS Steering Committee was aware of these upcoming flights in 1998, when it authorized the formation of an interagency Advisory Committee on Orthoimagery and Elevation Databases and charged it with exploring the long-term issues related to the on-going development and maintenance of digital orthophotos for Nebraska. Among the issues considered by the Advisory Committee was the anticipated need for updated orthophotos based upon this new 1999 source photography. For some areas of the state there were significant changes between 1992-93 and 1999, and for many GIS applications the currency of orthoimagery is a significant consideration.

The Advisory Committee also considered several other issues related to the potential updating and revising of DOQs. Among these was the issue of which map projection should be used to develop the DOQs. Because of the partnership with USGS, the 1992-93 based DOQs were developed in a Universal Transverse Mercator (UTM) projection (*think orange wedges or slices*). UTM is the standard map projection used for most national or global geospatial datasets. However, for most state and local government use an alternative map projection, the State Plane Coordinate System, is preferred.

Based upon its research and assessment of interagency need, the Advisory Committee recommended that a pilot project be undertaken to develop new 1:12,000 DOQs for Lancaster County based upon the new 1999 imagery and projected into both UTM and State Plane Coordinate Systems. In addition, the proposed pilot project was structured to evaluate a range of possible production methodologies and specifications and to establish a baseline for resources required for a statewide effort. The GIS Steering Committee endorsed this Lancaster County DOQ pilot project and the Natural Resources Commission successfully completed the pilot in the summer of 2000. Based on the results of the Lancaster County DOQ pilot project, the Advisory Committee has recommended statewide production of the revised DOQs, based on new 1999 imagery and projected in both State Plane and UTM Coordinate Systems.

How we will get there. The Nebraska Department of Natural Resources has entered into a workshare agreement with the USGS to produce revised DOQs based upon 1999 aerial photography and the 10-meter DEMs. These revised DOQs will be produced in both UTM and State Plane Coordinate Systems. The workshare agreement calls for this work to be completed by June 30, 2002. The workshare agreement is based on a 50/50 split of state/federal resources and the state resources will be provided through existing DNR resources. DNR estimates that this project will require approximately \$75,000 - FY 2001, \$75,000- FY 2002. and \$50,000 - FY 2003.

ELEVATION MODEL

Develop a statewide surface elevation model dataset based on a 10-meter grid; and a proposed process for its on-going cooperative maintenance and enhancement.

Why it is a priority. Surface elevation models are another geospatial dataset that has been prioritized for development by both the Nebraska GIS Steering Committee and the Federal Geographic Data Committee because it is one of a select subset of framework databases that provide basic data infrastructure for a wide cross-section of GIS applications and geospatial data users. Most surface elevation models, commonly known as Digital Elevation Models (DEMs), are based on a regularly-spaced grid of points for which the elevation of the earth's surface is known at each point.

The availability of DEMs for a given area enables a wide variety of GIS applications to be undertaken for which the relative altitude or slope of the earth's surface are important characteristics. The availability of DEMs also provide the data infrastructure to enable a GIS to generate a 3-D model of the earth's surface and drape aerial photography and/or conceptual project plans over that 3-D model for a "real world" perspective. Some examples of DEM applications are as follows:

DOQs. DEMs provide the information that is necessary to remove the distortion of the earth's surface terrain from aerial photography and are therefore a necessary ingredient for the development of DOQs.

Soils. DEMs provide information on the earth's surface features which is used in the process of updating and creating digital soil maps for older paper county soil survey maps.

Floodplain and Watershed Delineation. The surface feature and hydrologic modeling capabilities possible through DEMs are used in the delineate floodplains and watershed areas.

Site Selection. DEMs provide the digital information necessary to develop 3-D models of the earth's surface and are therefore valuable tools for visualizing different settings in the process of site selection for a wide variety of applications.

Where we are now. As a result of the same three-year partnership agreement between NNRC and the USGS that produced the DOQs, a statewide DEM database was also completed for Nebraska in 1998. These DEMs are based on a grid of regularly-spaced points, 30-meter apart, and were a framework database used to develop the DOQs.

Because of the broad range of applications for this basic infrastructure database, the Nebraska GIS Steering Committee included elevation databases in the charge of the interagency Advisory Committee on Orthoimagery and Elevation Databases, when it authorized its formation in late 1998. Responsibilities for making recommendations on these two key databases were combined in one advisory committee because the production of DOQs requires and is closely related to a surface elevation model.

Where we are going. In the GIS Steering Committee resolution supporting a Lancaster County DOQ/DEM pilot project to evaluate the methodology, resources requirements and product specification for developing revised and updated DOQs, it was recommended that the pilot project be structured in a manner to evaluate the merits of creating DOQs based upon a 10-meter grid DEMs instead of the 30-meter grid used to produce the 1992-93 DOQs. The DEM provides the foundation data that is needed to remove the distortions in the aerial imagery that are caused by terrain or slope. Upon completion of the Lancaster County pilot project, it was determined that the quality of

DOQs were sufficiently improved with the use of 10-meter DEMs, over the 30-meter DEMs, that the resources required to develop 10-meter DEMs were justified. Based upon the results of this pilot project, it is recommended that future statewide DOQ production (1:12,000) should be based on 10-meter DEMs.

How we will get there. The Nebraska Department of Natural Resources has entered into a workshare agreement with the USGS to produce 10-meter DEMs and revised DOQs based upon 1999 aerial photography and the 10-meter DEMs. The workshare agreement calls for this work to be completed by June 30, 2002. The workshare agreement is based on a 50/50 split of state/federal resources and the state resources will be provided through existing DNR resources. DNR estimates that this project would require approximately \$35,000 per year for FY 2001-2002.

PUBLIC LAND SURVEY SYSTEM

Develop a statewide standard reference PLSS dataset including all of the section and quarter section corners, their estimated locational coordinates, and standard identifiers for each PLSS corner; and a proposed process for its on-going cooperative maintenance and enhancement.

Why it is a priority. A Public Land Survey System (PLSS) database is another geospatial dataset that is a priority for development by the Nebraska GIS Steering Committee because it is one of a select subset of framework databases that provide basic data infrastructure for a wide cross-section of GIS applications and geospatial data users. A geospatial PLSS database provides both standard identifiers and locational (latitude/longitude) coordinates for the PLSS corners.

The PLSS section corners in Nebraska are the basis for defining all land ownership in our state. Establishing reasonably accurate locational coordinates for these corners provides a necessary foundation for modernizing local government land records. There are approximately 100,000 such PLSS corners in Nebraska, and they were originally surveyed roughly 125 years ago. In theory these PLSS section corners define one-mile squares, but the practical reality is that there is wide variations in the actual distance between the original placement of these corners.

However, it is the original placement of these corners that legally defines all land ownership parcels. Determining the "real world" coordinates of these original corner placements is the biggest hurdle that is slowing the adoption of modern geospatial technologies to manage and access land ownership records. There is a wide range of state, local and federal government agencies and private sector entities that utilize land ownership data. Since the PLSS is the legal foundation for defining all land ownership parcels in Nebraska, and geospatial land ownership data is needed by a wide variety of entities, the development of a geospatial PLSS database must be a key component of the state's data infrastructure development plans.

Where we are now. The GIS Steering Committee has worked through an interagency PLSS Database Advisory Committee and the State Surveyors Office to test both a methodology and an organizational model for the cooperative development of a PLSS database. An interagency pilot project to develop mathematically-based estimates for the original locations of the PLSS corners was undertaken in Adams County in 1998. Since

then, the State Surveyor has used similar methodology to develop PLSS databases for Merrick and Dodge Counties and for a portion of the U.S. Forest Service lands in Nebraska.

The spatial accuracy required from a PLSS database varies considerably depending upon the planned application. For example, for most applications involving PLSS section corners in Nebraska's sandhills a spatial accuracy of ± 50 feet is probably sufficient. However, for mapping property corners in downtown Lincoln or Omaha, one may need a spatial accuracy in the range of ± 3 feet. As the requirements for spatial accuracy increase, the costs associated with the development of that geospatial data become much higher. Consequently, it is not cost-effective to develop a PLSS database for the entire state which has the spatial accuracy needed for the most demanding applications. For this reason, the PLSS pilot efforts were designed to achieve a spatial accuracy for the PLSS corners that could serve a wide range of applications, but would not be adequate for the most demanding applications. To address the need for enhanced accuracy in some areas, the pilot PLSS database was also specifically designed so that it could be upgradeable, to enhance its spatial accuracy with the investment of additional resources.

That pilot project efforts in Adams County were successful in creating a PLSS database for the 24 x 24 miles area (16 townships) of Adams County that contains the estimated coordinates for over 9,000 PLSS section, 1/4 section, 1/16-section corners and centers of sections. The pilot developed a PLSS databases in which the average error of the estimated corner locations was 16.6 ft. and 95% of the estimated locations were within 34 feet of the actual original corner placement. The pilot project also demonstrated that the spatial accuracy of the overall database could be upgraded by the selective addition of more modern and accurate survey information. As part of the pilot project, standardized identifiers were assigned to all of the PLSS corners to facilitate later data sharing. This test PLSS database has since been used as a base map by a private vendor to build a digital property parcels database for Adams County. The State Surveyors Office is also working with the Department of Property Assessment and Taxation in Dodge County to develop a relatively low-to-moderate cost procedure for converting existing paper property parcel maps to a digital geospatial format based on this PLSS database model.

These pilot projects demonstrated that the software and methodology tested for developing a PLSS databases is a cost-effective, workable approach for developing a statewide PLSS database. However, the pilot project also suggested that the organizational approach/model tested in pilot project is probably not appropriate for large-scale, statewide development of this database. The organizational model tested was based on the voluntary participation of multiple public entities, with each entity contributing personnel to do data entry and processing. The pilot projects did demonstrate that this decentralized organizational approach could work in those special areas where highly motivated and knowledgeable personnel were available and had the time to dedicate to this the project. However, the pilots also suggested that in most situations it will take significantly more resources for training and coordination in support of these decentralized efforts that would be required for a more centralized approach, based on a core group of trained personnel.

Where we are going. The PLSS pilot projects have provided a blueprint for a cooperative approach to developing a common-reference, statewide PLSS database, which can be steadily enhanced by on-going cooperative interagency efforts. The PLSS

pilots demonstrated that the technical methodology used provides a cost-effective approach for initially developing mathematically-based, estimated locational coordinates for the original placement of PLSS corners. This approach also provides a database with standardized identifiers for PLSS corners, which will lay the foundation for PLSS data sharing and the on-going cooperative enhancement of the PLSS database for Nebraska. The pilot efforts also demonstrated that the overall spatial accuracy of a PLSS database, developed by this methodology, can be built upon and enhanced by the later addition of new and more accurate surveying data.

Current resources available in the State Surveyors Office allow that office to respond, in a limited manner, to unique opportunities to assist specific counties or agencies as they wish use this methodology to develop a PLSS database for limited areas. Significantly more resources will be needed to develop a statewide, common reference PLSS database and thereby provide the data infrastructure needed for the statewide modernization of land records in compatible formats. Based on their pilot project experience, the State Surveyors Office currently offers the very rough estimate of 50 person-years to develop a statewide PLSS database using this methodology.

The challenge now is to develop an organization model suitable for the cooperative development and maintenance of this core infrastructure database. The pilot projects demonstrated the widespread interest in and need for this database and a willingness to support cooperative efforts, given the appropriate leadership and structure. Among the entities that currently invest resources in the collection and use of PLSS data and are therefore potential partners in its cooperative development and maintenance are the following: city and county local governments, natural resources districts, USDA agencies, Bureau of Land Management, Dept. of Roads, Game and Parks Commission, Dept. of Property Assessment and Taxation, Dept. of Natural Resources, State Surveyor, and the banking and real estate interests in the private sector.

While the pilot projects demonstrate the widespread support for cooperative PLSS efforts, they also suggested that a totally voluntary, decentralized efforts is not a practical, cost-effective approach for the development of this database. The need to develop practical mechanisms for intergovernmental partnerships and collaboration for the PLSS (cadastral) was also recognized in a Western Governor's Association resolution passed in June 2000.

"1. To address multiple land related issues, Western Governors recognize the importance of the collection, integration, maintenance and distribution of digital geographic data representing the legal land subdivision from the PLSS, land ownership and other related information. To this end, WGA encourages member states, local governments and tribal entities and the private sector to engage in a coordinated effort that will lead to standardized best practices and land record modernization as well as a solid digital cadastral infrastructure.

2. Western Governors support the general recommendations of the Western Cadastral Data and Policy Forum including:

- a. Partnerships: Develop Partnerships that maximize state, tribal, federal and local participation and collaboration in important programs for cadastral data collection and maintenance.*

- b. Access: Promote sharing of cadastral information among jurisdictions to support critical state functions and regional activities.*
- c. Funding: Support increased funding and resources for the collection and maintenance of cadastral data through federal, state and local collaborative efforts.*
- d. Standards: Support the development and implementation of consistent cadastral procedures and data standards across jurisdictions.*
- e. Education: Inform and educate policy makers about the benefits and use of cadastral information.*

3. Western Governors recommend the BLM, in conjunction with the Western Governors Geographic Information Council, develop a comprehensive, unified plan for GCDB implementation across the West. This plan needs to address technical issues (e.g. data content), policy issues (e.g. data sources), and resource issues (e.g. funding).

4. Western Governors urge BLM to complete, enhance, and maintain the GCDB in coordination and partnership with states. Western Governors call on Congress to provide the necessary funding for BLM to undertake this important effort."

How we will get there. While new technical issues and concerns will undoubtedly surface, many of the known technical issues (methodology, standards, etc.) have been addressed as part of the PLSS pilot efforts.

Development of Intergovernmental Model. The major challenge now is to engage the various stakeholders in a collaborative process to develop a rough consensus around an intergovernmental model that can facilitate the cooperative development and on-going maintenance of this core infrastructure database. Such a process will likely need to make recommendations that will involve legislation and funding issues. For such a process to ultimately be successful, it will be important to have support for the process from policy makers in both the Executive and Legislative branches and key associations representing the various stakeholders. The GIS Steering Committee will work with the State's Chief Information Officer, the Governor's Policy Research Office, the Legislative Council, and the Nebraska Information Technology Commission to explore the optimum forum for bringing the various stakeholders together with a goal of producing recommendations by the end of calendar year 2001.

Merging Existing Low-Resolution PLSS Databases. There currently exists two relatively low-resolution, statewide PLSS databases available for public use. Both were derived from digitizing section corners as shown on the USGS 1:24,000 topographic quad maps and therefore have a spatial accuracy which cannot be verified without extensive investigation. The Natural Resources Commission developed one in the early 1990s and the other was developed by the Bureau of Land Management in 1997 to provide a basis for the PLSS pilot projects. A considerable amount of error checking has already been done between the two databases. Each database has some distinct built-in features, which facilitate its use in specific applications. During 2001, the new Department of Natural Resources and the State Surveyors Office will work together to integrate the best features of these two databases to create one standard, low-resolution PLSS database, with standard identifiers for all PLSS corners. This low-resolution PLSS database can then serve as an interim common reference PLSS database and also serve as the framework for

on-going cooperative efforts to develop an enhanced PLSS database. This effort can be accomplished through existing resources.

PLSS Enhancement As Opportunities Allow. Until a more comprehensive approach has been developed for PLSS enhancement, the Nebraska GIS Steering Committee and the State Surveyors Office will actively encourage public and private entities to work with the State Surveyors Office to do any PLSS development in a format consistent with the database model developed in the PLSS pilot projects. To the extent that the State Surveyors Office has resources available, they will provide assistance to state, local and federal government entities in this pursuit. This effort can be accomplished through existing resources.

TRANSPORTATION NETWORK DATABASE

Develop a statewide (1:24,000) transportation network dataset for all state-maintained highways and all local roads, including a system of common reference identifiers for each road segment; and a proposed process for its on-going cooperative maintenance and enhancement.

Why it is a priority. A comprehensive statewide transportation network database is another geospatial dataset that has been prioritized for development by both the Nebraska GIS Steering Committee and the Federal Geographic Data Committee. It is a priority for development because it is one of a select subset of framework databases that provide basic data infrastructure for a wide cross-section of GIS applications and geospatial data users.

A comprehensive statewide transportation network database would include an accurate geospatial representation of the location/route of the state's highways, roads and streets along with standard identifiers for each road feature and at least a minimum subset of attribute data related to those roads. For a state like Nebraska that covers a large geographic area, highways and other roads are critical components of the public infrastructure. As we move increasingly into the digital world, so too has digital geospatial information about those road networks become critical components of the data infrastructure that is important for a wide range of applications. Among the applications for which geospatial road network databases are important are the following.

Transportation Planning. A comprehensive digital map of the current Nebraska road networks provide the core foundation data for a wide range geospatial analysis related to planning and evaluating solutions to future transportation needs.

Highway and Road Maintenance. In a similar manner a comprehensive digital map of Nebraska road networks provides the foundation for visually displaying and communicating current, planning, and needed road maintenance activities and geospatial analysis related to those activities.

Economic Development. Transportation is a very important variable in most economic development scenarios. The ability to readily display the range of transportation services available close to a possible economic develop site can be a major factor in site selection decisions.

Transportation Routing. Digital road network maps also provide the foundation for the rapid and efficient routing of wide range of transportation services ranging from hazardous waste, to oversized loads, to emergency response vehicles, to school buses.

Public Safety and Emergency Response. A comprehensive digital geospatial road map is critically important piece of information in times of an emergency or disaster. The ability to rapidly identify, display and communicate alternative routes to a specific site is vital.

Where we are now. Nebraska has approximately 95,910 miles of state and local roads. Within the past decade, Nebraska Department of Roads (NDOR) has created, and continues to maintain digital graphics and associated attribute records for 9,967 miles of state-maintained highways in Nebraska, at a scale of 1:24,000. Another 10,367 miles of local arterial routes and 8,839 miles of local collector routes are in the process of being digitized and inventoried for the agency's GIS section, with a target completion date of December 2000. When this is completed, geospatial data on some 29,173 miles of the 95,910 miles of Nebraska roads information will be available as part of a statewide transportation geographic database with a map accuracy level of 1:24,000.

Over the last year, an interagency Transportation Database Advisory Committee of the GIS Steering Committee has focused its planning efforts on how the approximately 66,735 miles of local roads that are not currently part of this statewide road network database might be added and maintained. During this same period, NDOR has engaged in an intensive GIS strategic planning effort for its agency. As a result of this agency-wide GIS planning effort, the need to incorporate these local roads into the existing NDOR's GIS base map has been raised. Currently, some local governments have developed geographic transportation databases as part of their transportation planning and maintenance efforts, or for E911 efforts. Research and planning efforts focused on developing a comprehensive geographic transportation database must explore the possibilities of integrating these locally developed transportation databases into a comprehensive statewide database, as well as exploring how other road networks, not currently available in a geographic database, can be developed.

Where we are going. The interagency Transportation Database Advisory Committee has stated its strong support for NDOR's effort to develop and incorporate the additional 19,206 miles of local arterial routes and local collector routes into its 1:24,000 scale statewide transportation database by December 2000.

In its efforts to explore ways to develop and incorporate the additional 66,735 miles of local roads, the Advisory Committee has focused on developing a collaborative process between local governments and NDOR. From the Advisory Committee's perspective, local governments will likely have a greater need for local road data and will likely need higher levels of spatial accuracy for this data than will NDOR. For reason, an approach was outlined which will seek to facilitate the on-going integration of locally produced and updated road network data into a comprehensive statewide road network database. The Advisory Committee proposed that NDOR's role in this collaborative process would be to provide a starting framework for a comprehensive statewide road network database, including database standards to facilitate integration, and to serve as an on-going data integrator as new or enhanced road network data becomes available.

How we will get there. The Advisory Committee recommended that NDOR undertake two significant database development efforts to build the initial framework to support this on-going collaborative process. NDOR maintains individual "General County Highway Maps" and "City Plats" graphical files that are not currently incorporated into the NDOR's GIS/Geospatial system. These files contain vectorized, geo-referenced graphical representations of all the local roads and streets, but they are currently patterned to designate surface type. To provide a comprehensive starting point for this collaborative process, it was a recommendation of the Advisory Committee that NDOR converts these graphical files into single-line representations of each road segment and brings them into a statewide, geospatial road network database. In so doing, it was recognized that the geospatial representation of these local roads might not have the same spatial accuracy as other road network elements currently in the NDOR geospatial database. This will produce an initial statewide geospatial transportation network database that includes all the highways, roads and streets, although the spatial accuracy of some elements may vary. NDOR estimates that they will be able to develop this initial comprehensive road network database by June 2002.

The Advisory Committee also recommends and supports efforts by the NDOR to take one additional step to develop a framework for an on-going process of collaborative enhancement of this road network database. The Advisory Committee recommends that NDOR should take the lead in working with local governments to develop a system of common identifiers for all geospatial road network features (road segments, intersections, etc.) consistent with NSDI Framework Transportation Identification Standards. This will provide common framework for incorporating enhanced road network data, as it is developed through local governments and other agencies. NDOR estimates that they will be able to develop this process by June 2003.

NDOR is currently in the process of developing its own agency-wide GIS Strategic Plan. It is anticipated that these initiatives will be incorporated into that strategic plan and that the resources will be available from existing agency funding.

GOVERNMENTAL UNIT BOUNDARIES

Develop a statewide (1:24,000) geospatial dataset of the key Nebraska governmental unit boundaries and a proposed process for its on-going cooperative maintenance and enhancement.

Why it is a priority. A set of geospatial databases that provide both the location and shape of the key governmental unit boundaries (municipal, congressional or legislative district, counties, etc.) is another dataset that has been prioritized for development by both the Nebraska GIS Steering Committee and the Federal Geographic Data Committee. It is a priority for development because it is one of a select subset of framework databases that provide basic data infrastructure for a wide cross-section of GIS applications and geospatial data users.

A wide variety of data collection activities and public policy decisions involve referring to a given activity or resource relative to its location within a particular governmental unit. The availability of geospatial databases that outlines these governmental unit boundaries allows the use of geospatial technology to analyze data relative to its

particular governmental unit and facilitates achieving public policy objectives relative to those governmental units.

Where we are now. The GIS Steering Committee created a Governmental Units Database Advisory Committee to identify which core governmental unit boundary databases are needed, to assess their current availability, and to develop recommendations for their development, maintenance and distribution. The Advisory Committee identified the following core geospatial governmental unit databases as ones that have been developed by a variety of agencies and as currently being available to the general public and public agencies:

Legislative Districts	Congressional Districts	State Board of Education
Board of Regents	Supreme Court Districts	Voting Precincts
NRD Districts	Counties	Township/Range
Fire Districts	Game and Parks Districts	School Districts

The Advisory Committee noted that while these boundary databases were maintained by and available from a variety of agencies, for the average GIS user it was not always readily apparent how one would go about getting a copy of the database. The Advisory Committee also noted that most of these databases are fairly static in terms of the frequency of boundary changes. Some however, such as the school districts database maintained by the Dept. of Education are dynamic in nature and so the currency of the data is an important consideration for some applications. The Advisory Committee also noted that while these governmental boundary databases are available, many of them are not currently documented with standardized metadata which facilitates both their cataloging in geospatial data clearinghouses and allows users to evaluate and properly utilize the databases.

The Advisory Committee was unable to identify a readily available source a few key governmental boundary databases. While information on these governmental boundaries was available in a paper format, it was not apparent were current information on these boundaries could be reliably accessed in a digital, geospatial data format.

Municipal Boundaries	Tribal Lands	Public Power Districts
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Where we are going. Based on its research, the Advisory Committee has recommended that for those core governmental unit boundary databases currently in existence, efforts should be made to document them with standardized metadata and the databases should be listed in the Nebraska Geospatial Data Clearinghouse so that they are more readily accessible to the GIS user community.

For those boundary databases not readily available in a current, geospatial format, the Advisory Committee has recommended that efforts should be made to encourage their development and the development of systems to maintain those databases that are dynamic in nature. Of these databases, the Advisory Committee focused its initial attention on the municipal boundary database because of the widespread need for this data. The Committee was unable to identify any requirement for the reporting of municipal boundary changes to state government. The Census updates its geospatial municipal boundary geospatial database every ten years. The best source that the Advisory Committee was able to identify for report of this dynamic data was the Dept. of Roads. Because municipalities receive funding support, through the Dept. of Roads, for their maintenance of State Highways and local streets that are located within their

jurisdiction most report, on an annual basis, changes in those boundaries to the Dept. of Roads.

How we will get there. Over the next year, the GIS Steering Committee will work with agencies that maintain governmental unit boundary databases to encourage them to develop standardized metadata for those databases that are not currently so documented. These agencies will also be encouraged to list their databases in the Nebraska Geospatial Data Clearinghouse, as a means to make this data more readily accessible to the GIS user community. As part of its agency-specific GIS strategic planning initiative, the Dept. of Roads has decided to include municipal boundaries in its overall geospatial database. Updated municipal boundaries will be available in 2001 as a result of the 2000 Census. The effort by the Dept. of Roads to incorporate, and update on an annual basis, this municipal boundary data in their geospatial database will provide an updated source for this key geospatial database.

SOIL SURVEYS

Develop a statewide (1:24,000 and 1:12,000 in some areas) dataset of digital county soil survey data (SURRGO) including unique identifiers for each soil type; and a proposed process for its on-going cooperative maintenance and enhancement.

The County Soil Survey Manuals were developed by the Natural Resources Conservation Service (NRCS) (formerly the Soil Conservation Service). These county soil manuals contain maps that outline the approximate shape and location of areas with similar soil characteristics, and provide detailed associated information on the characteristics of each particular soil type. The NRCS has developed national standards (known as SSURGO) for the conversion of these paper maps to digital geospatial format. As part of the process of conversion to digital SSURGO format, the spatial accuracy of the county soil maps will be enhanced by recompiling the maps on a DOQ base map. When one considers that Nebraska includes approximately 49,500,000 acres or 77,355 square miles of area, the overwhelming magnitude of the task of converting these paper soil maps to digital geospatial format becomes apparent.

Why it is a priority. Because of the overall importance of agriculture to Nebraska's long-term social and economic well-being, the development of digital soils data is another statewide geospatial databases that has been prioritized for development by the GIS Steering Committee. The development of high resolution, digital county soil survey data, in a geospatial format, will provide key data that is needed for farm and ranch management applications to take advantage of GIS technology. Geospatial soil data also provides key information that can be used, in combination with other data, for siting decisions such as landfills, housing developments, and sanitary lagoons. This digital geospatial soils data is also an important factor in determining the value of property for assessment purposes. The federal government has prioritized the development of SSURGO soils data and has made available to NRCS specially earmarked funding to support these efforts during a five-year window of FY 1997-2002.

Where we are now. Three years ago, three agencies (USDA-Natural Resources Conservation Service, Conservation and Survey Division-UNL, and the Nebraska Natural Resources Commission) initiated a large-scale, joint effort to develop statewide digital county soil surveys at a 1:24,000 map scale. Prior to initiated in this large-scale

development effort, the only available statewide digital vector soils database was at a more generalized map scale of 1:100,000. As of September 2000, SSURGO soils data has been developed for 42 Nebraska counties.

Where we are going. The goal of this joint development effort is to develop statewide SSURGO digital county soil maps by June 2003. The project is currently on schedule.

How we will get there. This statewide SSURGO soils development project is a joint effort by the USDA-Natural Resources Conservation Service, Conservation and Survey Division-UNL, and the Nebraska Dept. of Natural Resources and has been underway for three years. Existing resources will be used to complete the project, with completion anticipated by June 2003. DNR estimates that its share of these database development costs will be approximately \$100,000 per year for FY 2000-2003.

STREET ADDRESSES DATABASE

Develop a statewide (1:24,000) dataset with all street centerlines and standard street address ranges for each street segment; and a proposed process for its on-going cooperative maintenance and enhancement.

Why it is a priority. As the human services-related applications (education, welfare, public safety, emergency response, etc.) of GIS technology have grown, a parallel need for a geospatial street address databases has also grown. A geospatial street address database includes a map of street centerlines and attribute data that provides the street address ranges for each side of a street segment (i.e. for each city block). Such a geospatial street address database provides the foundation data for a process known as geo-coding, the efficient, large-scale determination of the locational coordinates for common street addresses. This then allows common street addresses to be plotted on a map and integrated with a wide variety of other spatial data. While human services-related applications are one of most common areas of need for geospatial street address databases, they are also used for other applications such as determining the spatial coordinates for regulated facilities or transportation routing.

Where we are now. Street address geospatial databases are currently available from both the public and private sector. There is considerable variability in the overall quality and costs of these databases. One of the most common and readily available street address geospatial database is the TIGER files developed and maintained by the US Census Bureau. While the overall quality of the TIGER database is pretty good, it has sufficient problems such that a market has developed to support the efforts of private firms to enhance the TIGER database and sell the resulting product. The quality and currency of the TIGER data varies by geographic area and the more rural areas frequently have poorer overall quality. The use of private street address databases can be costly and usually involve a license agreement, which prohibits the sharing of the database with other users. Some local governments are developing local street address databases for use within their E911 operations or broader local GIS applications. State and local government agencies have in the past used both public and privately available street address geospatial databases.

Where we are going. There is a growing use and interest in street address geospatial databases by state agencies such as the Nebraska Health and Human Services System and

local government agencies for emergency response. Several private and quasi-private entities are investing considerable resources to develop and maintain these street address geospatial databases. An interagency exploration is needed to determine the aggregate demand for this type of data and to research the possibilities for partnership in developing or licensing a street address geospatial database for shared public agency use.

How we will get there. The GIS Steering Committee will authorize the formation of an intergovernmental Street Address Database Advisory Committee to research and make recommendations on the possibilities for a shared street address geospatial database. This intergovernmental research effort can be accomplished with existing resources with an estimated completion timeline of December 2001.

INITIATIVE 2 — LAND RECORDS MODERNIZATION. *Promote and facilitate local government land record modernization and GIS development.*

One of the most promising and cost-effective application areas of GIS technology is the modernization of how local government land records are maintained and accessed. In addition to land record modernization, there are numerous other potential local government applications of GIS technology (emergency response, public health and safety, zoning, taxation, street and utility maintenance, etc.) The property parcel/land record information maintained by local governments is also one of the framework geospatial databases that are needed by a wide variety of state, local and federal agencies and private entities. It is in the interest of the broader GIS user community that this land record information be developed in a standardized geospatial format that is accessible to multiple users at the local, state and federal level. Because of the limited resources at the local government level, partnerships will be necessary in many areas to facilitate the development and maintenance of this data.

The GIS Steering Committee has identified several projects that would help to facilitate the process of modernizing these local government land record systems and the development of the digital geospatial property parcel databases that are needed for a variety of state, local and federal applications. Two of these project proposals are specifically outlined under this initiative. Two other related projects have been outlined under the Priority Database Development and Maintenance Initiative, and these are the statewide development of digital geo-referenced aerial photography, and a Public Land Survey System database. Together, these two databases would provide the foundation base maps necessary for the development of geospatial property parcel databases. Another related project proposal is the Regional Professional Service Centers, which is outlined under the following Technical Assistance Initiative. The concept behind these Regional Service Centers is to provide a means whereby local public agencies and state government can pool both their demand and resources to support regional technical centers to provide GIS, surveying, and other mapping services. Under the Education/Outreach Initiative, the proposal to develop of an education/outreach program with a particular focus on local government officials also supports this Land Records Modernization Initiative.

MULTIPURPOSE LAND INFORMATION SYSTEM GUIDELINES

Develop and publish a set of guidelines and related background educational materials to assist local governments in the modernization of their land records and the development of a multipurpose local GIS.

Why it is a priority. In Nebraska, most changes in land records and related property parcel information flow through and are maintained at the local government level. GIS and other geospatial technologies offer many powerful capabilities to enhance the overall efficiency by which these land records can be maintained and accessed. If implemented correctly, these same technologies can also offer other enhanced capabilities that can assist a local governments in carrying out a multitude of responsibilities. Together these enhanced capabilities provide a significant incentive for local governments to invest in GIS and related technologies.

The initial development of a local government GIS requires a substantial up-front investment of public resources that, if approached correctly, will pay long-term dividends. Unfortunately, GIS and related technologies are rather complex and are frequently beyond the experience of the local government officials who find themselves in the position of make these public investment decisions. An intergovernmental Property Parcel Task Force, convened by the GIS Steering Committee, issued a 1996 working paper entitled "Facilitating Land Record Modernization in Nebraska." Among the working paper recommendations was the development of standards and guidelines to assist local governments to secure the maximum return for their GIS investments.

The importance of such an effort was also noted in the United 2000, Nebraska's Statewide Technology Plan, which included the following action item, *"Develop guidelines for core local government, multipurpose geospatial datasets; and model inter-local agreements for the cooperative development, maintenance and funding of geographic information systems core data."*

Where we are now. In response to the Property Parcel Task Force recommendation, the GIS Steering Committee authorized the formation of an Advisory Committee on Standards for Multipurpose Land Information Systems. This Advisory Committee includes representatives from a variety of local government agencies, state agencies and the private sector. Over the last couple of years this volunteer Committee has drafted and circulated for feedback and comment several sections of these Land Information System Guidelines. Following revisions based upon any feedback received, each section of these guidelines has then been approved by the GIS Steering Committee. The Advisory Committee has now completed the four core sections it initially committed itself to complete and these section are available for public use. The Committee is now working on three or four supporting sections of the guidelines.

Where we are going. It is the intention of the Advisory Committee to develop and circulate a multi-section Guidebook on Standards for Local Government Multipurpose Land Information Systems. The purpose of this Guidebook is to assist local government officials to make public investments GIS technology in a manner to secure the best return on those investments. Because this technology is rapidly evolving, this Guidebook will be produced in a loose-leaf format to facilitate its on going revision. Each section is also made available on the Internet as it is completed.

How we will get there. The Advisory Committee's work relies on the expertise of its volunteer members, the feedback of relevant user communities, and the support of the GIS Steering Committee's Coordinator. As the Guidebook sections near completion, the Advisory Committee and the GIS Steering Committee will solicit feedback and endorsement from other IT coordinating bodies such as the NITC Community Council,

the NITC Technical Panel, the Nebraska Intergovernmental Data Communications Advisory Council (NIDCAC), and other related governmental and/or professional associations. The Advisory Committee intends to complete its initial development of the Guidebook by July 2001.

MODEL INTER-LOCAL AGREEMENTS

Develop and distribute model inter-local agreements for the cooperative development, maintenance and funding of geographic information systems core data.

Why it is a priority. Local governments maintain and/or use numerous databases for which location or place is a critical database component. This locational data is used in a wide variety of applications (emergency response, transportation planning and maintenance, taxation, schools, utilities, property ownership, public health and safety, zoning, etc.) Because of this wide use of locational information, geographic information systems (GIS) technology holds considerable potential for local government applications.

The utilization of this powerful information technology by communities and local governments in Nebraska has been hampered by the necessity of making considerable up front public investments in the development of a local framework geospatial data infrastructure. This data infrastructure consists of core geospatial databases such as property parcels, transportation networks, surface feature maps, addresses, and public utilities networks. The costs of the initial public investment in the development of these core databases is offset by their multiple applications and long-term usability, if they are developed and maintained correctly.

Because multiple agencies, at various levels of government, need these same core geospatial databases, there exists considerable potential for the cooperative development and sharing of these databases. Cooperative development offers a promising approach for overcoming this database development hurdle that hampers local government GIS utilization. The development of model inter-local agreements would facilitate these cooperative geospatial database efforts.

Where we are now. In 1999, Senator Wehrbein introduced LB 731, which called for the creation of a rural community coordinator who would define and provide hardware and connectivity in rural areas of the state. The bill was amended to allow local governments to combine personal computer orders to replace those that were not Y2K compliant, and second, to create a process to identify rural automation needs. While the bill was not ultimately passed, the needs raised by the legislation and the related discussion provided the stimulus for a local government technology study sponsored by the Nebraska Intergovernmental Data Communications Council (NIDCAC). One of the recommendations of the final January 2000 Local Government Technology Project report was the following, *"NITC Community Council establish standardized agreements addressing the use of inter-local agreements to develop and fund core data, including: Geographic Information Systems."*

In response to this specific recommendation, the following action item was included in the United 2000, Nebraska's Statewide Technology Plan, *"Develop guidelines for core local government, multipurpose geospatial datasets; and model inter-local agreements for the cooperative development, maintenance and funding of geographic information systems core data."*

Where are we going. The project will publish or otherwise make available one or more model agreements to facilitate cooperative local government geospatial data development and maintenance.

How we will get there. The GIS Steering Committee and its Coordinator will take the lead on this research project. This project will research both Nebraska-based and national model agreements for the cooperative development, maintenance and funding of geospatial data. The project will involve input from the local government officials and representatives currently involved in the GIS Steering Committee and the NITC Community Council. No direct additional cost for developing these inter-local agreement models is anticipated. It is currently anticipated that this project can be completed by interagency efforts to pool available agency staff resources and be completed by July 2001.

INITIATIVE 3 — TECHNICAL ASSISTANCE. *Provide technical assistance to local governments and state agencies.*

With the growing interest in GIS, the technology is no longer just being used by a limited number of fairly large public agencies. It is becoming a powerful mainstream information technology, with a wide variety of state and local level agencies either developing or having an interest in developing GIS applications. With this growing interest in the technology, there is a parallel growing need for technical assistance to help these agencies develop their GIS/geospatial data or applications. These technical assistance needs range from guidance in designing and planning the development of an in-house capability; to specialized GIS application development; to large-scale geospatial data development projects; to on-going development and maintenance of specific GIS applications.

Up to this point, the primary operational model in Nebraska has been for each agency or local government to develop and maintain its own in-house GIS capability. This has worked fairly well in that most of the early adopter agencies already had technical personnel on board and had a fairly wide range of GIS/geospatial applications they wanted to develop. With more and more agencies expressing interest in the technology, it is time to consider the merits and efficiencies that might be gained by arrangements to aggregate the demand and resources available to support these technical services. The need for this pooling of demand and resources is particularly apparent in the rural and non-urban areas of Nebraska, where individual local governments or agencies frequently lack the resources to support the technical services they need to adequately fulfill their responsibilities. At the state government level, it is a question of the optimum use of public resources. Should each new agency interested in utilizing GIS technology develop its own in-house capabilities or should other models be explored for how best to meet this growing interest in the technology. The GIS Steering Committee has outlined the following two conceptual models for addressing this growing need for GIS technical assistance. Over the next several months, the Steering Committee will seek to engage policy-makers in a process of exploring these and other options for meeting these needs.

REGIONAL PROFESSIONAL SERVICE CENTERS

Explore the support for and feasibility of developing regional professional service centers to assist local governments and other public entities to aggregate and provide for their surveying, mapping, GIS, and the possibility other professional service needs.

Why it is a priority. Property parcel maps and their associated land records are geospatial databases that are needed for a wide variety of applications at the local, state, and federal government level and in the private sector. For this reason, property parcel databases have been designed as a framework database by the federal government and as a priority database by the Nebraska GIS Steering Committee. In Nebraska property parcel data and associated land records are primarily maintained at the local government level. GIS and other geospatial technologies offer numerous capabilities to enhance the efficiency of maintaining and the accessibility of property parcel maps and related data. For these reasons, several of the local governments in the more populous areas of Nebraska are investing in GIS technologies and are developing digital geospatial property parcel data.

However, for the less populous areas of Nebraska, most local governments lack the financial resources and the local professional technical expertise to support GIS and geospatial data development. Without state or regional initiatives to assist these local governments, it is not likely that most of them will have the capability, in the near future, to modernize and thereby make more accessible the property parcel maps and land ownership records they maintain.

Where we are now. In a working paper entitled “Facilitating Land Record Modernization in Nebraska,” published by a Property Parcel Task Force of the GIS Steering Committee, a number of recommendations were made. One of those recommendations highlighted the need for state-local partnerships to provide the resources needed to assist local governments to modernize their land records. In June 2000 the Western Governor’s Association passed a resolution recognizing the importance of land record modernization and cadastral (PLSS and property parcels) data in general. That resolution called for the development of partnerships to maximize state, local, tribal and federal collaboration to develop and maintain modern cadastral data.

A Land Record Modernization Advisory Committee formed by the Nebraska GIS Steering Committee has focused its attention on the problems related to the limited financial and technical resources available to many local governments in rural Nebraska. The assessment of this Advisory Committee parallels that of the earlier Property Parcel Task Force and the Western Governor’s Association resolution relative to the need for state-local partnerships. It is the Advisory Committee's assessment that without such partnerships, it is unlikely that local governments in the rural areas of Nebraska will have the resources necessary to modernize their land records and thereby make them available to other users.

Where are we going. The Advisory Committee has determined that one of the most promising avenues for overcoming these obstacles in rural Nebraska is a regional approach that could serve to aggregate both the financial resources available and the demand for professional technical services. In addition to GIS/mapping services, the Advisory Committee sees the possibility for incorporating surveying and other professional technical services in these regional centers, depending upon the needs in a particular region. For such a regional approach to be viable, it is the belief of the Advisory Committee that state government would need to be an active partner. To further develop and explore the support for a regional service center initiative, the Advisory Committee has committed itself to discussing and exploring this possibility with the relevant local, regional and state government officials and quasi-governmental agencies.

How we will get there. Any realistic effort to pursue such an initiative must involve local and state policy makers early in the discussion and policy formation phases. Strong local government support for such an initiative is a necessary precondition for pursuing this regional concept. The Advisory Committee will seek to explore the concept with local government officials during the fall/winter of 2000-01. If there appears to be sufficient interest and support among local government officials for the concept, the GIS Steering Committee will seek the support of the state's CIO, the NITC, the Governor's Policy Research Office and the Legislature's representative to the GIS Steering Committee to convene a working group to further explore and develop the concept during the 2001 calendar year. It is expected that this policy development effort can be pursued through the existing resources of the GIS Steering Committee and its member agencies.

GIS SERVICE BUREAU

Work with the Executive and Legislative Branches of state government to explore the need and support for designating and providing base funding for a GIS service bureau for state government. The service bureau's mission would be to provide (upon their request) state/local agencies with assistance in the development and analysis of geospatial data, the development of GIS applications, and to provide operational support for implementing the GIS Steering Committee's coordinated development priorities.

Why it is a priority. With the growing interest in the use of GIS technologies by a broader array of state agencies, the establishment or designation of a GIS Service Bureau for state government should be considered. The intent of establishing such a service bureau would not be to centralize all GIS services, but to provide agencies with an alternative for securing new or additional GIS services instead of the necessity of adding technical staff and/or capabilities directly to their agency's operation. Such a service bureau could, upon request from a state/local agency, assist in the development and analysis of geospatial data, the development of specialized GIS applications, and the utilization and customization of geospatial tools. The availability of such a service bureau would lower the threshold for new agencies to utilize the technology and enable existing users to undertake large-scale, short-term, development projects without the need to expand existing capabilities. A GIS service bureau could also provide needed operational support for implementing the GIS Steering Committee's coordinated development priorities and should be closely associated with the Steering Committee for this reason.

Where we are now. Currently there are several state agencies which have developed GIS capabilities designed to address their specific agency's mission. The following state agencies currently have significant GIS capabilities: Dept. of Natural Resources, Dept. of Roads, Dept. of Environmental Quality, Game and Parks Commission, Nebraska Legislature, State Surveyors Office, and the Conservation and Survey Division-UNL. There are several other agencies that have limited GIS capabilities or are currently in the process of developing their capabilities, among these are: Dept. of Education, Health and Human Services, Dept. of Labor, and the Bureau of Business Research-UNL.

At this point, if a state agency wishes to pursue a GIS-related project that is beyond their current GIS capabilities, it is not clear where that agency should look for that service within state government. When the GIS Steering Committee receives such an inquiry, it can only suggest the possibility of checking with one of the state agencies that currently has GIS capability. Since none of these agencies have a specific mandate to provide GIS

services for other state agencies, their response depends on whether they have the resources available and if they feel that the requested service falls within their agency's mandate. IMServices does not currently have GIS capabilities, although it has expressed a willingness to consider developing such capabilities if it perceives that there is sufficient demand and resources available.

Where are we going. The Dept. of Property Assessment and Taxation has informed the Steering Committee that it will likely need to either develop GIS capabilities or contract for those services to develop and maintain the property parcel maps for the counties for which it currently provides property tax assessment services. If Nebraska follows the patterns that have developed in other states, in the near future new or expanded GIS services will also be desired by agencies such as the Health and Human Services System, Dept. of Economic Development, Dept. of Agriculture, and the Nebraska Emergency Management Agency.

An assessment is needed to evaluate the anticipated need for GIS services by state agencies over the next several years. Parallel with that assessment of need, is the need for a policy dialogue related to how this growing need for GIS services should best be met within state government. There are three general approaches, or combinations of them, that should be considered. The first is a continuation of the present model where each agency develops and maintains its unique GIS capabilities roughly proportional to its peak demand for those services. A second model is the designation and funding of a state GIS service bureau which would have the authority and mission, as well as the hardware, software, and technical expertise available, to contract with agencies to provide GIS services on a one-time or on-going basis. Another model is a contracting for these services through the private sector.

How we will get there. There are several coordination/management related needs or proposals in this strategic plan that will require the support and involvement of policy makers in the both the executive and legislative branches of Nebraska government to be successful. This proposal for consideration of the need for a state GIS service bureau is one such proposal. Over the next year, the GIS Steering Committee will work with the office of the CIO, the NITC, the Governor's Policy Research Office and the Legislature to explore the proper interagency forum to research and make recommendations related to the creation of a state GIS service bureau and other coordination/management issues related to the development and maintenance of a geospatial data infrastructure for Nebraska.

INITIATIVE 4 — EDUCATION/OUTREACH. *Promote an educational outreach program designed to maximize the overall return on public investments in the development of geographically referenced databases and GIS systems by providing educational materials, presentations and coordination services to the public officials and technical staff who will be making these investment decisions.*

While GIS can no longer be considered a new technology, it is still new and relatively complex for many of the agencies and policy makers who are now considering their initial public investments in the technology. Without education and/or technical assistance these public sector decision-makers can easily make costly mistakes in their initial GIS investment decisions. The risks of costly mistakes have less to do with the hardware and software, and more with data purchase or development decisions. Public investments in a GIS educational/outreach program, directed toward government decision-makers, will increase the probability of wise public investment decisions in GIS technology. Such an education program will increase the likelihood that costly geospatial databases developed for one area and application, will not only work as intended for that application, but also for other areas and applications. Such an education/outreach program is a vital component of a coordinated GIS development effort.

In addition to the specific project proposals outlined under this initiative, the GIS Steering Committee is also involved in several other related projects. One such project is the Multipurpose Land Information System Guidelines project outlined under the Land Records Modernization initiative. That project is focused on developing guidelines and related background materials to assist local government officials to make wise public investments in GIS technology. The GIS Steering Committee also facilitates communication/coordination within the growing GIS community by publishing of a regular Nebraska GIS Update Newsletter and by helping to sponsor a community-wide email list server. Over the last couple years, the Steering Committee has also actively supported the formation a new professional Nebraska GIS/LIS Association, which has education as one of its major foci. New potential projects under this initiative include:

GIS EDUCATION/OUTREACH PROGRAM

Conduct an educational outreach program designed to maximize the overall return on local government investments in the development of geographically referenced databases and GIS systems by providing educational materials, presentations and coordination services to the public officials who will be making these investment decisions.

Why it is a priority. To maximize the return from public investments in the development of geographically referenced databases, additional resources are needed for outreach and education of public officials. This need is particularly acute in relation to local governments. Local governments make substantial investments in mapping and aerial photography in the on-going course of fulfilling their areas of responsibility. For many county commissioners, county assessors, and agency directors these are new areas of expertise. Resources are needed to develop educational materials and plan and implement outreach and training programs. Public investments now in the education of public officials, will result in greater overall return from other public investments.

Additional resources are also needed to work with public and private entities to encourage and facilitate cooperative geospatial data development efforts. In most situations where a public entity is considering an investment in geospatial data development, there are other

entities that have similar geospatial data needs. In many situations, there is a major need for someone to serve as the bridge to inform these various entities of their common interests in having particular types of data developed for a given area. By facilitating this type of cost/resource sharing, commonly needed geospatial databases can be developed that the individual partners would not have been able to undertake on their own. Resources are needed for on-going outreach to state, federal, and local government agencies, and private industry to understand their data needs and to share that knowledge with others that might share those needs.

The up front investment of additional public resources to provide this needed outreach, education, technical support and coordination services for local government will pay long-term dividends. These dividends will come in the form of:

- increased coordination and cooperation,
- reduction in the number of duplicative or similar database development and maintenance efforts, and
- public investments in aerial photography, geospatial database development, and GIS systems that can serve multiple needs.

Where we are now. The GIS Steering Committee has attempted to address these outreach, education and coordination needs. However, its efforts have, of necessity, been limited because of the lack of program resources. The GIS Steering Committee seeks to facilitate communication/coordination within the growing GIS community by helping to publish a regular Nebraska GIS Update Newsletter and by co-sponsoring a community-wide email list server. Over the last several years, the Steering Committee has regularly staffed an educational booth at the Nebraska Association of County Officials Annual Conference and has provided other presentations as the opportunity and resources allow. The Steering Committee has also actively supported the formation a new professional Nebraska GIS/LIS Association, which has education as one of its major foci. The Multipurpose Land Information System Guidebook project, outlined under the Land Records Modernization initiative, is focused on developing guidelines to assist local government officials to make wise public investments in GIS technology. While seeking to address the need for education and outreach, all of these efforts are severely handicapped by the lack of program resources.

Where are we going. Because of the importance of education and outreach, relative to the goal of securing the maximum return on our public investments in developing a Nebraska spatial data infrastructure, this education/outreach program concept was submitted as an action item and incorporated in the United 2000, Nebraska's Statewide Technology Plan.

Addressing these needs in a comprehensive manner will require additional human resources to design, organize and conduct outreach and education programs and a budget to develop the educational materials, provide the needed hardware and software, and to cover the costs of travel and meetings. Ideally such a program would have at least two years to realize the benefits of investing in staff training, program design and outreach.

\$60,000 annually for increased human resources for outreach, education and coordination programs

\$30,000 program funding for first year's development and implementation of an outreach, education, and coordination program, with \$20,000 for any subsequent years

How we will get there. While the importance of this educational effort has been acknowledge by its inclusion in Nebraska's Statewide Technology Plan, efforts to actually fund and structure of this outreach program will require further dialogue with policy makers. In other sections of this Strategic Plan (*Initiative 5 ¾ Strengthen Coordination Capacity*) references are made to the need for a dialogue next year with policy makers related to the changing needs for GIS coordination structures and resources. This education/outreach proposal should be a part of that dialogue. In addition, other avenues will also be explored to determine the possibilities for cooperation in meeting these education/outreach program objectives by working with the NITC on other IT-related local government education initiatives, the Cooperative Extension Service, the universities, and the community colleges. If we are to secure the maximum return on upcoming public investments in spatial data infrastructure, it is important that state and local agencies work together to find creative solutions to address this education and outreach need.

NEBRASKA GIS SYMPOSIUM

Actively support efforts by the Nebraska GIS/LIS Association to organize a biennial Nebraska GIS Symposium to provide the broad range, intensive educational opportunity to the growing Nebraska GIS community.

Why it is a priority. There is a growing interest in GIS technology in all levels of government and the private sector. This interest spans a wide range of interest areas and/or applications and levels of knowledge and experience with the technology. The organization and hosting of a state GIS symposium is the most cost effective approach to address this growing and diverse interest in GIS technology. A Symposium format provides the opportunity for a wide range of workshops, most of them provided by leaders who volunteer their time and expertise. A Symposium also provides the opportunity for GIS practitioners to meet with and network with others in their area of focus and an opportunity for those new to the field to talk with more experienced professionals.

Where we are now. The GIS Steering Committee has been a leading force behind two previous Nebraska GIS Symposium that have been held on a roughly biennial schedule. These symposia have drawn between 300-400 participants. The Steering Committee also used the 1999 Nebraska GIS Symposium as a vehicle to help launch a new professional Nebraska GIS/LIS Association. One of the major foci of the new Association is education.

Where are we going. Another Nebraska GIS Symposium is scheduled for May 8-10, 2001 at the Cornhusker Hotel in Lincoln. The GIS Steering Committee will be co-hosting this event with the new Nebraska GIS/LIS Association. Attendance is expected to be in the range of 400 participants. Local government GIS implementation will be one of the key foci of the Symposium.

How we will get there. The new GIS/LIS Association is serving as the primary base for organizing the 2001 Nebraska GIS Symposium. The Symposium is scheduled for May

8-10, 2001 and planning is already underway with initial publicity to be mailed in early fall of 2000. The Symposium is expected to be self-supporting. Most of the organizational energy is provided by volunteers, with the exception of the time provided by the GIS Steering Committee's Coordinator to assist with organizational details. It is expected that existing resources will be adequate to organize this major educational event.

INITIATIVE 5 — DATA SHARING AND DISTRIBUTION. *Develop structures, standards, and processes that facilitate easy access to, integration, and usability of publicly available geospatial data.*

A key component of any coordinated GIS development strategy must be the development and maintenance of mechanisms to facilitate the sharing of commonly needed geospatial data. There are several essential elements to such a data sharing strategy. These include the easy ability to discover the existence of data and how it is accessed. The documentation of the data to facilitate its proper use is another essential element, as is the establishment and wide implement of data standards to facilitate data integration. Geospatial data users and types of data are diverse and data sharing strategies must address this diversity of users and needed data (natural resources, demographics, land records, transportation, utilities, city/regional/state/federal, etc.) Potential projects under this initiative include:

METADATA DEVELOPMENT

Initiate an on-going, active program to encourage and assist public agencies to document their geospatial databases with standardized metadata. Metadata program would include policy formation, outreach, periodic workshops, and technical assistance in creating metadata.

Why it is a priority. As noted before, a core set of framework geospatial databases provides the foundation for the Nebraska Spatial Data Infrastructure. Another key element in that spatial data infrastructure is the documentation of those core geospatial databases, and other databases, with standardized metadata. Metadata is *data about data*. Metadata documents how the data was collected or derived, what the different data codes and values mean, when the data was collected, where the data is available, and in the case of geospatial data, where the data was collected from and what spatial references were used.

Metadata is the key to facilitating data sharing and exchange. If someone gets a geospatial dataset from someone else it is difficult to determine the appropriate use of that data if it is not documented. Likewise, when there is a substantial public investment in the development of a database, the parallel development of metadata is important to preserve the public investment in that data. Without adequate metadata documentation, when the key staff members who originally developed a given database leave the organization, it is sometimes difficult to justify continuing to use that database. Without adequate documentation to explain how database figures or coding were derived it is difficult to defend policy or regulatory decisions based on that data. Standardized metadata also provides the basis for potential users to find available geospatial data through geospatial database search tools that have been developed around metadata standards.

Where we are now. National metadata standards for geospatial databases have been developed by the Federal Geographic Data Committee (FGDC) and adopted by the Nebraska GIS Steering Committee. In 1996 the Nebraska Library Commission, in cooperation with the Nebraska GIS Steering Committee, received a grant from the FGDC to train Nebraskans in the use of the metadata standards, to document several key geospatial databases, and to develop an online geospatial data clearinghouse. As a result of that grant the GIS Steering Committee organized a metadata training session, and several state agencies used the metadata standards to document one or more of their geospatial databases.

Since that time, resources have not been available to encourage and assist agencies with an on-going effort to document geospatial databases with standardized metadata. Informal surveys confirm that there exists a considerable quantity of public geospatial data for which standardized metadata documentation has not been developed.

Where are we going. To preserve the substantial public's investment in geospatial data, it is important that data is documented with standardized metadata. At its March 2000 meeting, the GIS Steering Committee endorsed the following policy statement related to metadata development and voted to refer it to the NITC Technical Standards Committee.

"To preserve the public's investment in geospatial databases and to facilitate data sharing, public agencies should document new geospatial data it collects or produces, either directly or indirectly, with metadata compliant with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (data describing the data). Systematic efforts should also be made to develop metadata for existing legacy geospatial data, as time and resources allow."

How we will get there. By June 2001, the GIS Steering Committee will work with the NITC Technical Panel to encourage the formal adoption of a metadata policy as part of the Nebraska's Information Technology standards.

While the formal adoption of a metadata standard will be helpful, it is very likely that additional action and resources will be needed to seriously address the intent of the policy statement adopted by the GIS Steering Committee. Unfortunately, the development of metadata is frequently seen as a tedious task that can be deferred by the busy geospatial specialists who are already knowledgeable about the data and therefore do not personally need the metadata. Successful metadata programs in other states frequently rely upon staff resources to actively work with agencies, on an on-going basis, to encourage and facilitate metadata development. These programs also frequently have a high visibility geospatial data clearinghouse, which serve to showcase an agency's geospatial data through the metadata they have developed. As part of proposed policy discussions, over the next year, related to strengthening coordinating capacity of the GIS Steering Committee, consideration should be given to providing some resources to facilitate metadata development. These resources could possibly be associated with an education/outreach program or the geospatial data clearinghouse project discussed below. As an example of metadata development costs, DNR estimates that to support its aggressive program to maintain current metadata for its agency developed data, it will allocate from existing resources approximately \$25,000 per year for FY 2001-2002.

GEOSPATIAL DATA CLEARINGHOUSE

Integrate and build upon existing agency geospatial data Internet listings and clearinghouses to develop a high-profile clearinghouse for locating and accessing Nebraska-related geospatial data.

Why it is a priority. Most GIS experts would suggest that 70 to 80% of GIS implementation costs are commonly related to geospatial data development or acquisition. One of the surest ways to reduce the level of investment required for geospatial data development is to locate existing geospatial datasets, developed by someone else that will meet some or all of your data needs. This is idea behind both the joint development of commonly needed framework geospatial databases and geospatial data clearinghouses.

Geospatial data clearinghouses are another key component of the evolving spatial data infrastructure. Data clearinghouses are intended to provide a systematic approach for cataloging and locating available geospatial data for a particular area or region. There is an evolving national network of these compatible clearinghouses. The information foundation for these data clearinghouses is the standardized metadata discussed in the proposed metadata project above. The clearinghouse allows a geospatial data user to go online and search for available geospatial data for a given geographic area and data theme of his/her particular interest. If available, the metadata will allow for either a direct link to the dataset, or provide information on how the user might get access to the data.

Where we are now. With the support of the FGDC grant discussed in the above metadata project, the GIS Steering Committee established in 1997 a Nebraska Geospatial Data Clearinghouse, which cataloged geospatial data from several state agencies. This Nebraska Geospatial Data Clearinghouse is currently hosted by Nebraska Online. At about the same time, the Nebraska Natural Resources Commission (now DNR) developed a similar geospatial clearinghouse, which cataloged the databases available through their Natural Resources Databank.

The original intent in creating the Nebraska Geospatial Data Clearinghouse was to provide the user community with a one-stop access point to search for available geospatial data related to the Nebraska area. The FGDC grant supported initial metadata training and development and the establishment of the geospatial data clearinghouse. Since the completion of the FGDC grant, there have been very limited resources available to maintain and promote this effort. As a result, few new databases have been added to the Nebraska Geospatial Data Clearinghouse catalog and it has assumed a rather low profile in the GIS user community. Because of its lack of resources, its low profile and the its lack of a reasonably comprehensive listing of available Nebraska geospatial databases, the Clearinghouse is currently limited in its ability to adequately perform its originally intended function.

Where are we going. The establishment and maintenance of a Nebraska clearinghouse for locating available geospatial data related to the geographic area of Nebraska remains a key component of the development of a Nebraska Spatial Data Infrastructure. If the GIS user community is to cooperate in the development and sharing of geospatial data, it is necessary to facilitate their locating and accessing available data. The tools incorporated within the Geospatial Data Clearinghouse were specifically designed with that intent. The shortcomings of the current Nebraska Geospatial Data Clearinghouse are not in the tools, but in the resources available to encourage the

development of standardized metadata and to promote and maintain the Clearinghouse. To more fully realize the important role of the Nebraska Geospatial Data Clearinghouse it is necessary to explore avenues to provide the necessary resources required to support its operation.

How we will get there. A subcommittee of the GIS Steering Committee should be convened to explore avenues for supporting a reasonably comprehensive Nebraska Geospatial Data Clearinghouse. Among the options that need to be considered are: finding additional resources to support its current configuration; merging the existing Nebraska Geospatial Data Clearinghouse with the DNR Databank Clearinghouse; moving the Nebraska Clearinghouse to another institutional base that can help provide the promotion and maintenance resources required. In assessing all of these options, it is important to bear in mind that the Clearinghouse operates on a foundation of metadata and that a successful Clearinghouse will probably require resources to assist and encourage agencies to develop standardized metadata. As with several other initiatives and projects outlined in this strategic plan, this project is also one that should probably be raised in proposed discussions with policy makers related to seeking enhanced coordination capacity for the GIS Steering Committee. Subcommittee exploration and development of recommendations should be completed by December 2001 and can be accomplished with existing resources. As an example of the costs associated with maintaining a geospatial data clearinghouse, DNR estimates that it requires approximately \$10,000 per year (from existing resources) to maintain its agency-specific clearinghouse.

GEOSPATIAL DATA SHARING COOPERATIVE

Promote and facilitate geospatial data sharing among public agencies through development of a Nebraska Geospatial Data Sharing Cooperative based on a common data sharing agreement.

Why it is a priority. As governmental agencies invest increasing amounts of public resources in the development of geospatial data, there is a growing pressure from public officials to recapture some of those resources through selling that geospatial data to other entities needing similar data. While this trend can be seen at all levels of government, it is particularly noteworthy at the local government level, where agencies frequently have very limited resources due to budget lids. While understandable, this trend threatens to develop obstacles in the path of developing a shared spatial data infrastructure, based on the joint development and sharing of available geospatial data.

If the concept of a shared spatial data infrastructure is to take root and flourish in Nebraska, it is important to present policy makers with an alternative model and with workable mechanisms to realize such a model. One such mechanism is the concept of a Geospatial Data Sharing Cooperative, which is designed to encourage and facilitate data sharing among its government agency members. All members of the cooperative agree to share geospatial data among each other at the cost of duplication or less. Within the cooperative, all members use the same data sharing agreement and sign it only once. As part of the cooperative agreement, members are free to sell their data to other entities that are not members.

Where we are now. As noted above, there is a growing trend in Nebraska for individual local governments to establish unique policies related to selling geospatial data

developed by that local government in an effort to recapture some of the development and maintenance costs. There have been similar discussions among policy makers within state government about the merits and methods of pursuing cost recovery for major geospatial database development efforts such as DOQs.

On the opposite side of this trend was this year's passage by the Legislature of LB 628. LB 628 applies to all public records and allows citizens to obtain copies of public records in any form it is maintained in, including print outs and electronic data. Under this statute, a fee can be charged but it cannot exceed the actual costs of making the copies available. While it is a bit early to make final determinations about the impact of this new statute, it appears that it may apply to geospatial databases.

At its July 1999 meeting, the GIS Steering Committee reviewed the principals behind a model Geospatial Data Cooperative currently operating in New York State. The Steering Committee determined that the concept was sound and useful and a working committee was established to further research the concept and to develop a draft data sharing agreement. After an initial working committee meeting, this effort was placed on hold in early 2000, pending an assessment of the impact of the proposed LB 628. At its May 2000 meeting, the GIS Steering Committee received a briefing on the LB 628, as it was ultimately amended and passed by the Legislature. At that time the Steering Committee determined that it appeared that there was still merits in pursuing the development of a Nebraska Geospatial Data Cooperative and directed the working committee to resume its development efforts.

Where are we going. The development of a Nebraska Geospatial Data Cooperative based on the following principals.

1. Cooperative members agree to share geospatial data with other cooperative members
2. Data sharing cooperative open to all government and quasi-governmental entities
3. Within cooperative, all members use same agreement, sign it only once
4. Data shared within cooperative at cost of duplication or less
5. Option to charge commercial users up to "fair market value" for datasets
6. Option to put data into public domain
7. Data ownership maintained by original producer of dataset
8. Data owner sole source for particular dataset
9. Data errors/corrections returned to data owner for dataset revision at owner's discretion
10. Encourages partnerships with private sector for joint benefits

How we will get there. A draft Geospatial Data Cooperative Agreement will be developed by the working committee and reviewed/revised by the GIS Steering Committee by May 2001. The draft agreement will be circulated to governmental entities that are potential members for their review and feedback. The Governor's office will be briefed on the concept and consulted about the possibility of an executive order directing state agency participation. It is expected that these steps could be completed by December 2001 and could be accomplished with existing resources. Following an initial signing by GIS Steering Committee member agencies, and hopefully other state agencies, an outreach effort will be required to market the concept to other Nebraska governmental agencies.

INITIATIVE 6 — STRENGTHEN COORDINATION CAPACITY. *Strengthen the GIS Steering Committee's operational capability to facilitate the implementation of priority geospatial database development decisions, data sharing, interagency/intergovernmental partnerships, and agencies' utilization of GIS technology.*

While Nebraska statutes define broad areas of responsibilities for the Nebraska GIS Steering Committee, the Committee has very little in the way of independent authority and/or resources to seriously address those responsibilities. With limited authority and no operational capability or budget, Steering Committee decisions and priorities can only be implemented through the sponsorship and active support of independent state, local or federal agencies. The coordination of GIS development for the overall good of the broad and growing Nebraska GIS user community is a unique and challenging mission not specifically shared by any other public entity. In some specific instances other agencies' missions and priorities are congruent with those of the Steering Committee and in those cases those agencies may take the lead on a project on behalf of the Steering Committee. However, where this parallel sense of priorities does not exist, the Steering Committee is seriously limited in its ability to implement its priorities.

Many of today's major geospatial data development efforts are only feasible through intergovernmental partnerships. The Steering Committee's structure is poorly suited to facilitating the actual implementation of those partnership projects. The availability of seed funding specifically dedicated to collaborative GIS development efforts and the ready access to institutional channels whereby the resources from intergovernmental partners could be efficiently combined and leveraged would enhance the Steering Committee's ability to implement collaborative GIS development projects.

In addition to the specific proposal that is outlined under this initiative, several other project proposals outlined in this strategic planning document would also contribute to this overall initiative to strengthen the GIS Steering Committee's coordination capacity. Key among these is the State GIS Service Bureau concept that is outlined under the Technical Assistance Initiative. The development of such a service center, within an existing agency, would provide the GIS Steering Committee with the capacity to operationally pursue goals and objectives which are not agency specific, but serve the broader GIS/geospatial data user community. In addition, the education/outreach program outlined under the Education and Outreach Initiative would provide the capacity to distribute GIS educational materials and technical assistance to the specific public policy makers who are currently making investment decisions. This program would also provide the resources to help identify the potential for and to facilitate data development partnerships. The enhancement of the Nebraska Geospatial Data Clearinghouse would provide the GIS user community with a focal point, which would emphasize the importance of data sharing and cooperative data development. In addition to these already discussed and defined projects, the following project specifically relates to this initiative to strengthen the coordination capacity of the GIS Steering Committee.

COLLABORATIVE DATABASE DEVELOPMENT FUND

Work with the Executive and Legislative Branches of state government to establish and fund a Collaborative Geospatial Database Development Fund dedicated to facilitating collaborative, interagency-intergovernmental partnerships focused on the development of priority database development efforts

Why it is a priority. There are currently broad public policy discussions related to the importance of enhancing the overall coordination of information technology investments by government agencies as a means to achieve the highest return on these public investments. As part of these discussions, consideration is being given to implementing new structures and procedures to encourage and facilitate this coordination.

Importance of Geographic Data. As noted before in this strategic plan, the geographic component of information has become increasingly important as information technologies, such as GIS, have been developed to display and analyze information based on its location. In automating the use of geographic information, it is important to develop and implement standards for collecting and recording geographic information. These geospatial data standards are important not only within a given organization, but also across organizations, as we seek to gain efficiency and provide improved service by sharing information between organizations.

Role of Framework Data. The cooperative development of core framework geospatial databases that have been designed through collaborative processes will do much to promote the widespread adoption and implementation of geospatial database standards. The development of most geospatial databases requires a substantial investment of time and resources. Therefore, if an existing database is already available that meets an agency's needs it is very likely that database will be used. The likelihood of an agency choosing to use an existing geospatial database is further enhanced if the database was developed using recognized standards.

When an agency chooses to use an existing geospatial database in a given application, it is likely that agency will also choose to incorporate the standards built into the existing database into other databases that are derived as part of that application. In this way, the standards that have been incorporated into key databases tend to migrate to and be implemented in other databases. This tendency of database standards to migrate is particularly pronounced with framework geospatial databases because these databases are used in such a wide variety of applications, and because they are frequently used as a foundation for the development of other databases.

The development of a select set of framework geospatial databases that incorporate the database features and standards needed to address a wide variety of user needs requires an up-front investment of public resources. However, such an investment in our state's spatial data infrastructure is a solid public investment because of the long-term public dividends that will result. Among these long-term dividends are the following:

- minimizes the duplication of effort by multiple agencies who otherwise would invest scarce public resources in the development and maintenance of similar sets of commonly needed geospatial databases;
- increases the sharing of geospatial data among agencies and levels of government by building a cooperative data-sharing culture and infrastructure based on shared data standards;
- facilitates the ability to integrate and analyze geospatial data related to a common geographic area, but originating from multiple agencies;
- facilitates the ability to piece together geospatial data from a variety of sources and from dispersed geographic areas into a coherent regional/statewide database mosaic; and

- enhances the quality of public policy decisions and the efficiency of service delivery due to the ability to integrate and analyze data from multiple public and private agencies.

Lack of Coordination Costs. While the development of this framework geospatial data infrastructure will require a substantial public investment, the lack of public policy decisions to make these infrastructure investments will likely result in higher long-term public costs. Absent a coordinated effort to develop these framework geospatial databases, a likely scenario is that multiple agencies will develop pieces of similar databases for their particular geographic area of need or responsibility. Even if consensus framework database standards already exist, there are likely to be numerous instances in which these framework database standards will not be followed. Consensus framework database standards are designed to meet the multiple needs of a variety of potential users. In many cases, their full implementation will be more costly than the development of a similar database that is designed to meet only the needs of the particular agency. Without a cooperative database funding source that is tied to these framework database standards, it is unlikely that most local governments or state agencies will make a greater investment than that which would be required to meet the needs specifically related to their mission or area of responsibility. Thus, while each of these individual geospatial database development efforts may be less costly, the combined public costs of multiple databases of a similar nature that are likely to be developed for the similar geographic areas will be higher than a cooperative public investment in the development of spatial data infrastructure framework databases.

Added to these public costs associated with the development and maintenance of duplicate/similar geospatial databases for the same area, are the costs incurred when one can not easily integrate data from different sources because they were not developed with the same standards. One example of this might be the difficulty in integrating state and local road networks across county lines in the case of an emergency. Another example is the difficulty of integrating a state agency's surface water data with a local or federal agency's data for the same stream. The public costs in these situations would come either from the inability to respond in a timely, efficient manner to an emergency; the possibility of inappropriate public policy decisions made on surface water issues because of the inability to consider all the data; or through the costs of the personnel resources required for the on-going conversion of one or more databases, in order to integrate the data. In the case of databases built around framework themes, these indirect public costs are compounded because databases of these types are frequently used as a foundation for the development of numerous other databases, thus spreading this problem of incompatibility.

Where we are now. In Nebraska, a major institutional stumbling block that hinders the evolution of this cooperative development process is the lack of a clearly defined mechanism for funding interagency, intergovernmental geospatial database development efforts. Historically, most database development efforts have been funded by a particular agency and/or level of government that had the need for that database to support its statutorily defined mission. As a result, most of our public funding mechanisms flow through these institutional (agency) channels and are closely tied to those specific agency missions. While it is not impossible to utilize these funding channels, it is certainly not an efficient mechanism for establishing cooperative interagency, intergovernmental database development priorities and to fund their development.

In some instances, the development of a framework geospatial database may be closely related to a given agency's mission. In these cases, it may be appropriate to rely upon these established agency funding channels as the primary mechanism to fund the bulk of a given database development effort. However, even in these cases, it is common that additional database features and/or standards are needed by other agencies to maximize the overall utility of a particular database. In these cases, the existence of a separate cooperative database funding mechanism, which could contribute to another agency's database development project, would increase the likelihood that these other features would be incorporated into the database and thereby maximize the public's overall return on this investment.

Federal government agencies are seeking to coordinate with state agencies, and state agencies are seeking to coordinate with local and regional public bodies in the development and maintenance of these framework geospatial databases. In some cases, this coordination can be accomplished through work-share agreements between agencies. However, frequently the most efficient approach is to have one entity do the work and the other entities or levels of government contribute to the database development project via financial contributions. A specific, stable funding mechanism for cooperative geospatial database development would be a great help in overcoming the institutional barriers to these cooperative efforts.

With certain framework databases, the need for a given database is widespread, and yet the responsibility for any particular agency to take the lead in its development is not clear. An example in Nebraska is a high resolution hydrography (streams and lakes) database. This database is a priority need for several state, local and federal agencies, and yet none of them has the clear responsibility, nor the available resources to be the primary underwriter of such a database development effort. A sustainable funding mechanism for cooperative geospatial database development could serve as the institutional catalyst to help bring the resources of these potential partners together to develop this needed database infrastructure.

Where we are going. The state has been successful in establishing a mechanism for the efficient coordination of the hardware and software infrastructure related to data and voice communications. The coordination of geospatial data infrastructure offers a comparable challenge. With sufficient public coordination and investment, Nebraska institutions can head down the road of cooperative geospatial data development. Such a path would encourage and facilitate data sharing between levels of government and agencies, and enable agencies to integrate data across data themes and across geographic areas. Without this coordination and investment, different agencies and levels of government will likely duplicate similar databases and create databases, which are difficult to integrate due to the lack of consensus database standards.

The GIS Steering Committee believes that the establishment of a cooperative funding mechanism is important to the development and maintenance of Nebraska's common information technology infrastructure. To highlight its concerns, the GIS Steering Committee, at its April 22, 1999 meeting, passed a resolution and endorsed a draft background white paper outlining the need for a cooperative funding mechanism to facilitate priority geospatial database development. The resolution noted that a variety of institutional approaches could be taken to establish a mechanism for funding cooperative geospatial databases. However, the resolution also noted that regardless of the

institutional approach taken, to maximize its overall effectiveness, any approach for funding cooperative geospatial data development should incorporate the following considerations:

- oversight by a coordinating body knowledgeable about geospatial data needs,
- adherence to established geospatial data standards,
- recognition of the need for periodic maintenance of these dynamic databases,
- commitment to data sharing among public institutions,
- provision of a sufficient level of funding to enable multi-year development projects, and
- coordination with the Nebraska Information Technology Commission.

How we will get there. There are several coordination/management related needs or proposals in this strategic plan that will require the support and involvement of policy makers in the both the executive and legislative branches of Nebraska government to be successful. The proposal for a collaborative geospatial database development fund is one such proposal. Over the next year, the GIS Steering Committee will work with the office of the CIO, the NITC, the Governor's Policy Research Office and the Legislature to explore the proper interagency forum to research and make recommendations related to the creation of a Collaborative Geospatial Database Development Fund and other coordination/management issues related to the development and maintenance of a geospatial data infrastructure for Nebraska.

APPENDIX

Nebraska GIS Steering Committee Resolution Encouraging Pilot Project Efforts to Develop a 1:24,000 National Hydrography Dataset for Nebraska

passed on 4/22/99

Whereas: Water and water-related issues play an important role in the economic, legal, and political life of Nebraskans,

Whereas: Numerous state, federal, and local public agencies and private interests collect and maintain separate water-related data which is utilized in a wide variety of management and regulatory applications,

Whereas: The existence of a common hydrography reference dataset would greatly enhance the ability of agencies to integrate multiple, stream-related datasets and thereby strengthen the resultant policy and management decision-making processes that depend on those datasets,

Whereas: The Federal Geographic Data Committee, the National States Geographic Information Council, the Nebraska GIS Steering Committee and numerous state and local agencies have all noted the importance of a common hydrography reference database and have designated geospatial databases of this type as a priority for development, and consequently, the Nebraska GIS Steering Committee established a Water Resources Database Advisory Committee to study and make recommendations related to the development of hydrographic databases,

Whereas: The Advisory Committee found that the draft standards for the 1:100,000 scale National Hydrography Dataset, as developed jointly by the U.S. Geological Survey and the U.S. Environmental Protection Agency, incorporate an array of database features designed to facilitate its use as a common geospatial reference dataset for a wide array of stream-related data collection and applications, including numerical identifiers for stream segments and lakes, common stream and lake feature names, scale-appropriate delineation of stream and lake features including banks and shorelines, and continuous centerline water flow paths for downstream network flow analysis,

Whereas: The Advisory Committee found that for many state and local water-related applications, a hydrographic dataset developed at the 1:100,000 scale does not have sufficient spatial accuracy (90% of the points within 167 feet) and that a dataset developed at the 1:24,000 scale (90% of the points within 40 feet) is more appropriate for many of these state and local applications, and

Whereas: The Advisory Committee, based upon its research, has recommended that the GIS Steering Committee encourage and facilitate cooperative efforts by state, local, and federal agencies to undertake 1:24,000 National Hydrography Dataset pilot projects as an important step toward the development of a statewide database.

Now Therefore, be it resolved:

- Section 1.* That a 1:24,000 scale National Hydrography Dataset (NHD), based generally on 1:100,000 scale NHD standards, but with an enhanced 1:24,000 stream vector coverage, would provide Nebraska with a common geospatial reference database for a wide range of applications for which the location and/or the characteristics of streams or other water bodies is an important consideration, and therefore this geospatial database should be a high priority for statewide, database infrastructure development.
- Section 2.* That a pilot project to develop a 1:24,000 NHD for one or more of Nebraska's hydrographic catalog unit (watershed) areas would provide the opportunity:
- a. to identify and resolve standards issues related to Nebraska-specific statutes and other database needs,
 - b. to determine optimal database development methodologies and procedures, and
 - c. to establish a baseline for the resources needed to develop a statewide 1:24,000 NHD for Nebraska.
- Section 3.* That the Nebraska GIS Steering Committee requests that cooperating agencies review current and planned projects that involve water-related geospatial database development efforts to determine the feasibility of incorporating 1:24,000 NHD standards into those efforts, and encourages state, local and federal agencies to explore other possibilities for supporting cooperative efforts to undertake 1:24,000 NHD pilot projects and eventual statewide development.

**Digital Orthoimagery and Elevation Databases
Advisory Committee Resolution Endorsing
Statewide Development of Updated and Revised DOQ/DEMs**

passed on 7/26/00

- Whereas:* Digital Orthoimagery and Elevation databases have been determined to be priority databases for development by the Nebraska GIS Steering Committee,
- Whereas:* Orthoimagery and Elevation database have been determined by the Federal Geographic Data Committee (FGDC) to be Framework Databases because of their use by a wide cross-section of geospatial data users,
- Whereas:* The Department of Natural Resources (DNR) (formerly the Natural Resources Commission) and the U.S. Geological Survey have completed a highly successful three-year partnership effort to develop a statewide 1:24,000 (30-meter interval) Digital Elevation Model (DEM) and a statewide 1:12,000 Digital Orthophoto Quad (DOQ) coverage based on 1992-93 aerial photography.
- Whereas:* New statewide aerial photography taken in 1999 as part of the National Aerial Photography Program (NAPP) offers the availability of source material for updating these DOQs with more current photoimagery.
- Whereas:* DNR-USGS have recently completed a Lancaster County pilot project study which was supported and encouraged by earlier resolutions from our intergovernmental Advisory Committee on Orthoimagery and Elevation Databases and the Nebraska GIS Steering Committee to determine the resources required, the optimum production methodology, and final product specifications for the next statewide generation of DOQs/DEMs.

Now Therefore, be it resolved:

- Section 1.* That DOQs/DEMs provide important reference databases that are widely used by a range of geospatial data users, that for many of those users the timeliness of the imagery data is a significant factor in the utility of the data.
- Section 2.* The Advisory Committee on Orthoimagery and Elevation Databases expresses its support for a joint effort by the DNR and the U.S. Geological Survey to undertake statewide development of revised and updated DOQs/DEMs with the final product consisting of revised DEMs based on a 10-meter interval grid and the updated DOQs based on 1999 NAPP photoimagery projected in both Universal Transverse Mercator (UTM) and the Nebraska Plane Coordinate Systems.
- Section 3.* In recognition of the leadership of DNR in this area, the Advisory Committee on Orthoimagery and Elevation Databases recommends that the DNR be designated by the Nebraska GIS Steering Committee as the state agency responsible for taking the leading role, in close coordination with the GIS Steering Committee, for the on-going development, maintenance, and distribution of 1:12,000 Digital Orthophoto Quads (DOQs) and 1:24,000 Digital Elevation Models (DEMs) for the geographic area of Nebraska.

Recommendations from GIS Transportation Database Advisory Committee

passed on 7/19/00

- Whereas:* Transportation databases have been determined to be a priority database for development by the Nebraska GIS Steering Committee,
- Whereas:* Transportation databases have been determined by the Federal Geographic Data Committee (FGDC) to be a Framework Database because their use by a wide cross-section of geospatial data users,
- Whereas:* The Nebraska GIS Steering Committee authorized and created our Advisory Committee on Transportation Databases to study and make recommendations on issues related to the development and maintenance of these geospatial databases for the geographic area of Nebraska and charged it with reporting to the Steering Committee on the following areas relative to Nebraska geospatial transportation databases:
- a) an assessment of the current status of each designated database, relative to the perceived short and intermediate-term needs;
 - b) an exploration of issues such as the range of likely users, current database completeness, accuracy, and the adequacy of current standards;
 - c) recommendations for how any necessary database development efforts should be undertaken, including possible responsible agencies and funding; and
 - d) recommendations related to database management issues, such as maintenance, integration, and distribution.

Now Therefore, be it resolved:

- Section 1.* That the Advisory Committee on Transportation Databases of the Nebraska GIS Steering Committee recommends and supports efforts by the Nebraska Department of Roads (NDOR) to develop the geospatial line work and associated core attribute data for the approximately 30,000 miles of state-maintained highways, local arterials, and local collector routes at the 1:24,000 map scale accuracy level, with December 2000 as a target completion date.
- Section 2.* That the Advisory Committee recommends and supports efforts by the NDOR to bring existing "General County Highway Maps" and "City Plats" (includes all local roads) into the NDOR GIS/Geospatial system and develop single-line vector representations for each road segment, with the understanding that this initial geospatial database may incorporate elements of varying levels of spatial accuracy and attribution but will provide the foundation for an upgradeable, comprehensive, geospatial state road network database for Nebraska, with June 2002 as a target completion date.
- Section 3.* That the Advisory Committee recommends and supports efforts by the NDOR to develop an initial statewide database of standard transportation reference points and transportation segments based upon a comprehensive geospatial state road network database and in accordance with the NSDI Framework Transportation Identification Standards, with June 2003 as a target completion date.
- Section 4.* That the Advisory Committee recommends and supports the Nebraska GIS Steering Committee's designation of NDOR as the recognized Data Integrator for a comprehensive statewide geospatial road network database with the understanding that included in this designation is the understanding that NDOR will assume the responsibilities of working with other producers of geospatial road network databases to incorporate, on an on-going basis, the "best available" data into a comprehensive statewide geospatial road network and make this data publicly available in standardized formats at limited distribution-based only, or no costs.

**Resolution on
Geospatial Data as Information Technology Infrastructure in Need of a
Cooperative Funding Mechanism to Facilitate its Development**

passed on 4/22/99

- Whereas:* Geospatial information is a significant subset of the information explosion that has occurred over the last decade and a wide and rapidly expanding range of information technology applications rely on geospatial databases and their embedded geographic location data as a key component of the information that facilitates the mapping, integration and analysis of the data.
- Whereas:* A select set of geospatial databases has been identified as framework databases (roads, streams property parcels, etc.), as they provide a foundation for the development of numerous other geospatial databases and a means for sharing and integrating these databases across a wide range of public and private sector applications, and as such, these framework geospatial databases are fundamental components of an underlying information technology infrastructure that supports a wide range of applications for which geographic location is a key component of the information.
- Whereas:* The cooperative development of framework geospatial databases can play a pivotal role in designing, implementing, and promoting geospatial data standards to ensure that the databases will address the widest practical range of needs for a given level of investment.
- Whereas:* The development of a select set of framework geospatial databases, incorporating the database features and standards needed to address a wide variety of user needs, is a solid public investment because the long-term public dividends will include:
- Minimizing the duplication of effort to develop similar databases,
 - Increasing the sharing of geospatial databases among agencies,
 - Facilitating the integration and analysis of data from multiple agencies, and
 - Enhancing the overall quality of public policy decisions due to improved availability of information.
- Whereas:* In response to recent broad public policy discussions related to the importance of enhancing the overall coordination of information technology investments by government agencies, the Nebraska Legislature charged the Nebraska Information Technology Commission with developing a statewide technology plan that incorporates long-range funding strategies (Nebr. Rev. Stat. Section 86-1506).

Now Therefore, be it resolved:

- Section 1.* That the Nebraska GIS Steering Committee believes that there is a need for, and urges the establishment of, a cooperative funding mechanism, specifically designed to facilitate the collaborative development and maintenance of framework geospatial databases, key elements of Nebraska's information technology infrastructure.
- Section 2.* That the Nebraska GIS Steering Committee believes that regardless of the specific institutional approach taken to establish such a cooperative geospatial database funding mechanism, its overall effectiveness would be maximized by incorporating the following considerations:
- a) oversight by a coordinating body knowledgeable about geospatial data needs,
 - b) adherence to established geospatial data standards,
 - c) recognition of the need for periodic maintenance of dynamic databases,
 - d) commitment to data sharing among public institutions,
 - e) provision of a sufficient level of funding to enable multi-year development projects, and
 - f) coordination with the Nebraska Information Technology Commission.